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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM 2001 RECEIVING WATER MONITORING REPORT EL SEGUNDO AND SCATTERGOOD GENERATING STATIONS LOS ANGELES COUNTY, CALIFORNIA

2001 Survey

Prepared for:

**Los Angeles Department of Water and Power
and El Segundo Power L.L.C.**

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EXECUTIVE SUMMARY

The 2001 National Pollutant Discharge Elimination System (NPDES) marine monitoring program for the El Segundo and Scattergood Generating Stations was conducted in accordance with specifications set forth by the California Regional Water Quality Control Board, Los Angeles Region (LARWQCB) in NPDES Permit Nos. CA0001147 and CA0000370, respectively. The 2001 sampling included physical and chemical monitoring of the receiving waters and sediments, and biological monitoring of infaunal assemblages and mussels. Fish and macroinvertebrate impingement studies were also conducted periodically throughout the year. Results of the 2001 sampling surveys were compared among stations and with previous studies to determine if the beneficial uses of the receiving waters continue to be protected.

The Scattergood Generating Station is owned and operated by the Los Angeles Department of Water and Power (LADWP). The El Segundo Generating Station, formerly owned by Southern California Edison Company (SCE), was purchased by El Segundo Power L.L.C. on 4 April 1998.

WATER COLUMN MONITORING

Water quality measurements in 2001 indicated that there was no detectable thermal elevation in the study area during either the winter or summer survey. Thermal differences noted between tides were probably due to solar insolation warming the surface layers. All noted temperature differentials between stations were minor or directly related to the depth of the station. Elevations of less than 1.5°C were noted at all stations between tides in winter; these appear to have been the result of insolation heating and then transport offshore on the tides. Only minor variations in temperature, dissolved oxygen (DO), pH, and salinity were detected. During the summer, surface temperatures were typically higher than in winter, with seasonal stratification apparent throughout the study area, including a cold water mass, which usually indicates upwelling, detected at some stations. All temperature, DO, pH, and salinity values were within the normal ranges for the area and seasons. Water quality measurements indicated that the cooling water discharges from the El Segundo and Scattergood Generating Stations did not have an adverse effect on receiving waters in the study area.

SEDIMENT MONITORING

Sediment Grain Size

In 2001, sediments in the study area consisted primarily of sand (average 89%) with a mean grain size of 2.46 phi (fine sand). Sediments were coarsest at offshore Station B5, upcoast of the Scattergood and El Segundo discharge structures, and finest at inshore Station B1, also upcoast of the discharge structures. At Station B5, mean grain size was more than five times the mean grain size at the other offshore stations. Sediments at Station B5 appeared to be composed primarily of relict red sands, which are known to occur at several nearshore locations in Santa Monica Bay. Sediment composition and distribution in the study area are likely affected by natural causes unrelated to the operation of the generating stations. No spatial patterns were apparent that would suggest effects from the Scattergood or El Segundo Generating Stations.

Sediment Chemistry

In 2001, sediment concentrations of all metals were highest at inshore Stations B1 and B2. Slightly higher concentrations of metals at Station B2 corresponded with higher amounts of fine sediments (silt and clay) at that station. Lowest concentrations of chromium, copper, and zinc were detected at nearshore Station B3, and lowest nickel concentration was recorded at offshore Station B5. Sediment metal concentrations in the study area were within the range found in sediments throughout the Southern California Bight and continue to be below levels determined to be potentially toxic to benthic organisms. No effects from the operation of the El Segundo and Scattergood Generating Stations were detected from the 2001 sampling.

MUSSEL BIOACCUMULATION

Analysis of metal levels in mussels near the El Segundo and Scattergood Generating Station in 2001 indicated bioaccumulation of metals was not appreciable. Tissue concentrations of copper in mussel tissue from the El Segundo Generating Station were lower than in 2000 or 1999, when copper levels were inexplicably high. Zinc concentrations from mussels collected in the same area were similar to values previously recorded since 1990. Copper and zinc concentrations in mussel tissue from Scattergood Generating Station were also similar to previously recorded values in the study area. Chromium and nickel have not been detected since 1990. Metal levels were not elevated in comparison to those found at other locations in the Southern California Bight.

BIOLOGICAL MONITORING

Benthic Infauna

The benthic infauna community sampled in 2001 was similar in composition to that of previous years. Species richness averaged 58 species per station, the second highest ever recorded for the study area. Abundance averaged 486 individuals per station (12,138 individuals/m^2). More than 38% of the abundance consisted of only one species, the polychaete worm *Apoprionospio pygmaea*, which has been a community dominant in all previous surveys. Abundance was greatest nearshore, while species richness and diversity were greater offshore than nearshore. This pattern is probably due to the finer, more poorly sorted sediments and calmer environment offshore. At Station B5, offshore and furthest upcoast, relict sands were encountered which appeared to alter the community by reducing the abundance of tube-dwelling worms, such as *A. pygmaea*. The abundance or species composition of the infaunal community did not appear to be influenced by the operation of the El Segundo or Scattergood Generating Stations.

Impingement

There were noticeable differences between the El Segundo and Scattergood Generating Stations in the species of fish and macroinvertebrates impinged in 2000. Some of these differences are likely due to plant operations, such as flow rates and heat treatment schedules, and some are due to drifting or schooling species encountering the intake structures on a random basis. All of the species common to both El Segundo and Scattergood were typical in the offshore habitat. The occurrence of these species throughout the Southern California Bight, and their continued abundance and high species diversity at both generating stations, indicated that operation of the El Segundo and Scattergood Generating Stations is not having an appreciable adverse effect on the diverse fish and macroinvertebrate populations in the study area.

CONCLUSION

The overall results of the 2001 NPDES monitoring program indicated that operation of the El Segundo and Scattergood Generating Stations had no detectable adverse effects on the beneficial uses of the receiving waters.

INTRODUCTION

This report presents and discusses the results of the 2001 receiving water monitoring studies conducted for the El Segundo and Scattergood Generating Stations. The 2001 monitoring program was conducted in accordance with specifications set forth in National Pollutant Discharge Elimination System (NPDES) Monitoring and Reporting Program No. 4667 (Permit No. CA0001147) issued for the El Segundo Generating Station by the California Regional Water Quality Control Board, Los Angeles Region (LARWQCB) on 29 June 2000, and NPDES Monitoring and Reporting Program No. 1886 (Permit No. CA0000370) issued for the Scattergood Generating Station by the LARWQCB on 29 June 2000 (Appendix A). Results of the 2001 surveys were compared among stations and with past physical oceanographic and biological studies to determine what effects, if any, the generating station discharge is having on the marine environment, and if the beneficial uses of the receiving waters are being protected. Sampling included physical and chemical monitoring of the receiving waters and sediments, mussel bioaccumulation, and biological monitoring of infaunal assemblages. Fish and macroinvertebrate impingement studies were also conducted periodically throughout the year.

The Scattergood Generating Station is owned and operated by the Los Angeles Department of Water and Power (LADWP). The El Segundo Generating Station is owned and operated by El Segundo Power L.L.C.

DESCRIPTION OF GENERATING STATIONS

El Segundo Generating Station

The El Segundo Generating Station is located at the south western boundary of the City of El Segundo. It consists of four fossil-fuel, steam-electric generating units. Units 1 & 2 are rated at 175 Megawatts (Mw) each and Units 3 & 4 at 335 Mw each. The total station rating is 1,020 Mw; however, the plant operated at 42.9% of total capacity in 2001 (Sanchez 2001, pers. comm.).

Seawater for cooling is supplied to Units 1 & 2 via a 10-foot (ft) (3.0-meter [m]) inside diameter (ID) concrete conduit which extends approximately 790 m offshore to a depth of -30 ft Mean Lower Low Water (MLLW). Approximately 144,000 gallons per minute (gpm) are supplied to the units through a screening structure at the plant end of the intake conduit. The screens remove trash, algae, and marine organisms which enter with the cooling water. After passing the screens, the cooling water is pumped to each of two steam condensers, one per turbine. The water temperature is increased 12.2°C when the units are operated at full capacity. The heated water is discharged through a 10-ft-ID conduit, which terminates approximately 1,900-ft (500-m) offshore at a water depth of -26 ft MLLW.

The cooling water system for Units 3 & 4 is separate from Units 1 & 2 but is essentially the same. Units 3 & 4 characteristics are: 12-ft (3.6-m) ID intake and discharge conduits, extending 2,600-ft (800-m) and 2,100-ft (640-m) offshore at -30 ft MLLW respectively; the cooling water flow is 295,000 gpm; and temperature rise across the condensers at full load is 12.2°C.

During the winter sampling on 28 March 2001, four circulating pumps were operating at Units 1 & 2 producing a flow of 207.4 million gallons per day (mgd). The ambient temperature was 16.4°C at the intake and 29.8°C at the discharge, 13.4°C above ambient. At Units 3 & 4, two circulating pumps discharged 199.3 mgd with an intake temperature of 19.9°C and discharge temperature of 19.7°C, 0.2°C below the intake temperature. During summer sampling on 20 September 2001, 207.4 mgd was discharged by four circulating pumps at Units 1 & 2 with 398.6 mgd discharged by four circulating pumps at Units 3 & 4. The discharge temperature was 40.1°C at Units 1 & 2, 19.1°C above ambient, and 27.4°C at Units 3 & 4, 6.8°C above ambient (Sanchez 2001, pers. comm.).

Scattergood Generating Station

The Los Angeles Department of Water and Power's Scattergood Generating Station is located in the City of Los Angeles at the western boundary of the City of El Segundo, approximately one-half mile north of the El Segundo Generating Station. It is comprised of three fossil-fueled, steam-electric generating units. Units 1 & 2 are rated at 185 Mw each and Unit 3 at 460 Mw. Units 1 & 2 have been on-line since 1958-1959 and Unit 3 since 1974. The total capacity of the plant is 830 Mw; however, the plant operated at 21.3% of capacity in 2001 (Mofidi 2001, pers. comm.).

Cooling water is drawn from Santa Monica Bay, at a maximum rate of 344,000 gpm, through a single 12-ft (3.6-m) ID conduit, which extends approximately 500 m offshore. Seawater enters the system through a 17.5-ft (5.3-m) ID vertical riser. The flow is directed horizontally to the inlet conduit through a 32.5-ft (9.9-m) diameter velocity cap which is suspended 5 ft (1.5-m) above the vertical riser. Seawater is drawn from near mid-depth at an elevation of -15 ft MLLW; the seafloor at this location is approximately -30 ft MLLW. Water enters the plant approximately 150 m inland via a walled forebay containing a screen array and pumping chamber. The design temperature increase for Units 1 & 2 is 10°C; Unit 3 operates at a temperature increase of 7.8°C.

Cooling water is discharged through a single 12-ft (3.6-m) ID conduit that runs parallel to the intake conduit. The discharge riser is also 17.5 ft (5.3-m) ID and has a lip at -15 ft MLLW. The discharge riser is located approximately 365 m offshore from the mean high tide line. Depth of the seafloor at this location is approximately -27 ft MLLW.

During the winter sampling on 28 March 2001, 112 mgd of cooling water were discharged by two circulating pumps. The discharge temperature was 26.7°C, 6.7°C above ambient. On 20 September 2001, seven circulators pumped 335 mgd of cooling water at a discharge temperature of 26.1°C, 5.0°C above the ambient intake temperature of 21.1°C (Mofidi 2001, pers. comm.).

DESCRIPTION OF STUDY AREA

Location

The study area is located in Santa Monica Bay between latitudes 33°56'N and 33°52'N; and longitudes 118°25'W and 118°28'W (Figure 1).The Chevron USA - El Segundo Refinery is located between the two generating stations. The Hyperion Treatment Plant, with its deep-water discharge, is approximately 450 m upcoast of the Scattergood Generating Station. Farther north is Marina del Rey Harbor and the mouth of Ballona Creek. Manhattan Beach Pier and the southernmost set of survey stations are downcoast of both generating stations.

Physiography

The general orientation of the coastline between Point Conception and the Mexican border is from northwest to southeast. The continental margin has been slowly emerging over geological time, resulting in a predominantly cliffed coastline which is broken by plains in the vicinity of Oxnard-Ventura, Los Angeles, and San Diego. Most of the coastal region drains via short streams which flow only during rain storms. However, only a small part of the storm drainage reaches the ocean directly; most is impounded by dams or diverted for other uses.

The eight islands offshore southern California influence water circulation and oceanographic characteristics along the mainland coast. The mainland shelf is narrow along the coast, ranging from less than 1.6 to more than 15 kilometers (km) wide, and averaging approximately 7 km. Seaward of the shelf is an irregular, geologically complex region known as the continental borderland, comprising basins and ridges which extend from near the surface to depths in excess of 2,400 m.

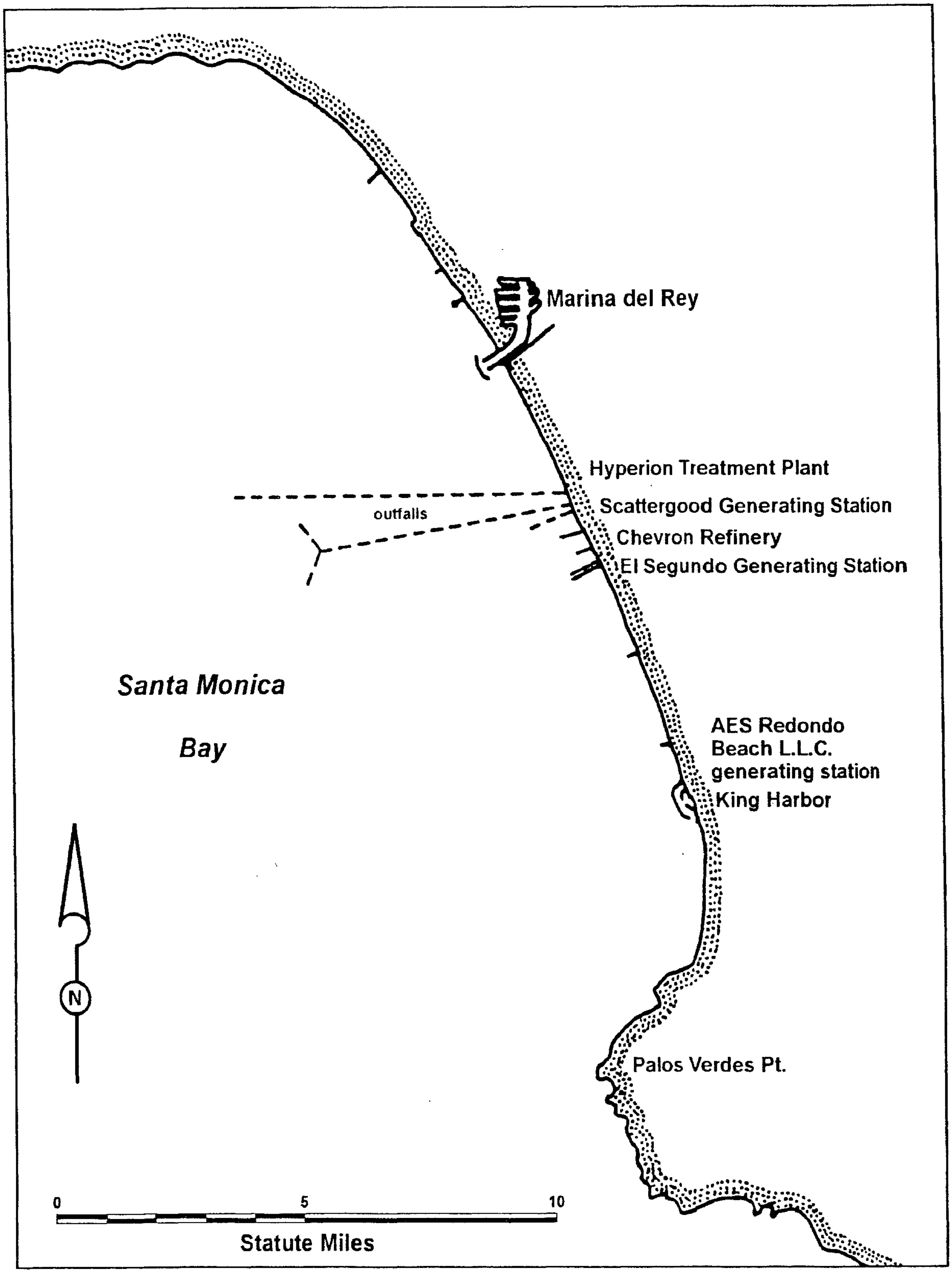


Figure 1. Location of the study area. El Segundo and Scattergood Generating Stations, NPDES 2001.

Oceanographic conditions in the study area are largely a function of offshore water masses, but these are modified by local conditions, especially local submarine topography. Santa Monica Bay is characterized by a gently sloping (about 0.5°) continental shelf. At water depths of about 80 m the shelf steepens as it approaches Santa Monica Basin (Terry et al. 1956). Within the bay the continental shelf ranges in width from a few hundred meters to about 19 km, forming a large central plateau which is dissected by submarine canyons.

Santa Monica Submarine Canyon comes to within 11 km of shore, offshore at Ballona Creek and the head of Redondo Submarine Canyon comes to within a few hundred meters of King Harbor in Redondo Beach. The shelf is broadest in the vicinity of the study area where the El Segundo and Scattergood Generating Stations discharge. Submarine canyons often cause anomalies in current direction and velocity; they may also enhance the transport of bottom water and act as migratory corridors for fish and invertebrates. In 1969, the predominant flow in Redondo Submarine Canyon was up-canyon, at an average speed of about 2.5 centimeters/second (cm/s) (Shepard and Marshall 1973).

Prior to development, the coast between Santa Monica and the Palos Verdes Peninsula consisted primarily of sand dunes, although wetlands were present adjacent to Ballona Creek. At present, about 50% of the shore comprises sandy beaches. Offshore the seafloor is composed largely of unconsolidated sediments which are generally finer with increasing distance from shore. Most nearshore sediments are olive green sands which form an elongate bed off Manhattan Beach and a large patch on the central plateau (Terry et al. 1956). Silty sand is found at mid-depths over much of the central plateau. Clay was a minor sediment constituent in the 1950s, but was more common in the 1970s (Bascom 1978).

Reduced wave intensity in summer allows sand and finer materials to accumulate nearshore; in winter, storms move them offshore to deep water (Grant and Shepard 1939). Nearshore sands typically move parallel to shore by longshore drift and may be transported into the heads of submarine canyons. Sand from the study area is expected to move southward into Redondo Submarine Canyon. Dikes, groins, and jetties have been constructed to interfere with littoral drift to aid in sand retention. In addition, beach nourishment, whereby sand is transported to the beach, is practiced. Since the Ballona Creek drainage was channelized in the 1930s, there has been little sediment input from the coastal plain; the major source of sand is now via runoff from the Santa Monica Mountains and the Santa Clara River (MBC 1988). Sediment moves downcoast from the Santa Clara River, around Point Dume, and into the northern portion of Santa Monica Bay during years of high runoff.

Climate

Southern California lies in a climatic regime broadly defined as Mediterranean, which is characterized by short, mild winters and warm, dry summers. Long-term annual precipitation near the coast averages about 46 cm, of which 90% occurs between November and April. Sea breezes are caused by differential heating between land and sea. During the summer, these breezes combine with the prevailing winds that blow out of the northwest to produce strong onshore winds. They typically start around noon and may continue through late afternoon, with speeds reaching 40 km per hour. In late fall and winter, reverse pressure systems frequently develop, causing coastal offshore winds from the southeast from November through February, typically between 1300 and 2000 hrs. Monthly mean air temperatures along the coast range from 8.3°C in winter to 20.6°C in summer, with the minimum dropping slightly below freezing and the maximum rising above 37°C.

Currents

Water in the northern Pacific Ocean is driven eastward by prevailing westerly winds until it impinges on the western coast of North America, where it divides to flow both north and south. The southern component is the California Current, a diffuse and meandering water mass which generally flows to the southeast (Jones 1971). No fixed western boundary to this current is defined; more than 90% of the bulk water transport is within 725 km of the California coast.

South of Point Conception, the California Current diverges; one branch turns northward and flows inshore of the Channel Islands as the Southern California Countercurrent (Jones 1971). Surface speed in the countercurrent ranges from 5 to 10 cm/s. The general flow is complicated by small eddies around the Channel Islands and fluctuates seasonally, being well developed in summer and autumn, and weak or even absent in winter and spring. Generalized surface water circulation off southern California is shown in Figure 2. Currents near the coast are strongly influenced by a combination of wind, tide, and topography. When wind-driven currents are superimposed on the tidal motion, a strong diurnal component is usually apparent. Therefore, short-term observations of currents near the coast may often vary considerably in both direction and speed.

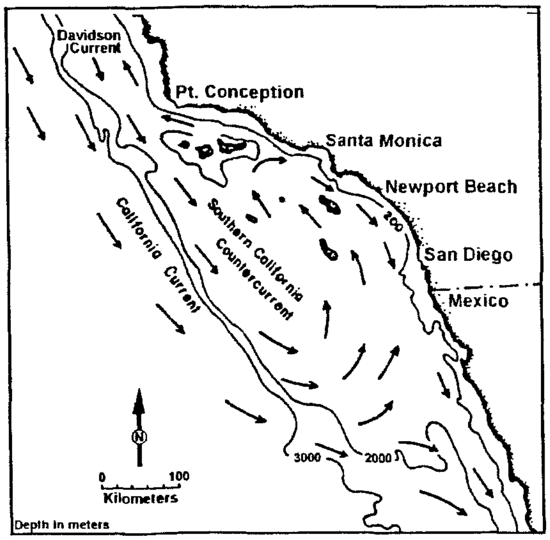


Figure 2. Surface circulation in the Southern California Bight (from Jones 1971). El Segundo and Scattergood Generating Stations NPDES, 2001.

Water generally enters Santa Monica Bay from the south and moves in a slow counterclockwise eddy. However, during winter a clockwise gyre may develop, with longshore flow of 2 cm/s (SCCWRP 1973, Hendricks 1980). Recent studies suggest that the clockwise gyre may be the dominant pattern on the shelf and that it reverses for a few days at a time due to tidal action. Tidal currents in Santa Monica Bay were slowest at the head of Redondo Submarine Canyon and greatest over the central parts of the broad shelf (Allan Hancock Foundation 1965).

Tides

Tides along the California coast are mixed semi-diurnal, with two unequal highs and two unequal lows during each 25-hour (hr) period. In the eastern North Pacific Ocean, the tide wave rotates in a counterclockwise direction. As a result, flood tide currents flow upcoast and ebb tide currents flow downcoast.

Upwelling

The predominantly northwesterly winds along the California coast are responsible for large-scale upwelling. From about February to October these winds induce offshore movement of surface water, which is replaced by the upwelling of deeper ocean waters near the coast. The upwelled water is colder, more saline, lower in oxygen, and higher in nutrient concentrations than surface waters. Thus, upwelling not only alters the physical properties of the surface waters, but also affects biological productivity by providing nutrients for the surface phytoplankton.

RECEIVING WATER CHARACTERISTICS

Water quality at El Segundo and Scattergood Generating Stations is affected by hydrology, currents, storm water runoff, industrial discharges, and ship traffic. In addition, climatological parameters such as solar radiation, humidity, and wind influence the condition of the receiving water.

The capacity of the marine environment to assimilate heated effluent depends on its ability to dilute and disperse the thermal discharge. The extent to which these functions are accomplished depends on the quantity and temperature of the thermal effluent relative to normal ocean temperature, ocean current patterns, and dispersion characteristics of the receiving waters. The following discussion focuses on natural ocean temperatures along the southern California coast and in Santa Monica Bay and addresses other physical and chemical oceanographic characteristics that influence the local marine biota.

Temperature

Natural water temperatures fluctuate throughout the year in response to seasonal and diurnal variations in currents, meteorological conditions such as wind, air temperature, relative humidity, and cloud cover, and other parameters such as ocean waves and turbulence. Natural temperature is defined by the California State Water Resources Control Board as "the temperature of the receiving water at locations, depths, and times which represent conditions unaffected by any elevated temperature waste discharge."

On the average natural surface water temperatures may be expected to vary diurnally 1°C to 2°C in summer and 0.3°C to 1°C in winter (EQA/MBC 1973). Factors which contribute to rapid daytime warming of the sea surface include weak winds, clear skies, and warm air temperatures. Conversely, overcast skies, moderate air temperatures, and the mixing of surface waters by winds and waves limit the daily warming. Natural surface water temperatures in Santa Monica Bay range from 11.7°C to 22.2°C annually (EQA/MBC 1973).

When there is a large difference between surface and bottom water temperatures, a steep temperature gradient between adjacent water layers of different temperatures (a thermocline) may develop. Natural thermoclines are formed when absorption of solar radiation elevates the temperature of surface water which then remains separated from the subsurface layer. Artificial thermoclines may result when warm water from a thermal discharge overlies cooler receiving waters. Off southern California, a reasonably sharp natural thermocline normally develops during the summer months; winter thermoclines are weakly defined.

Salinity

Salinity is a measure of the concentration of dissolved salts and is relatively constant in the open ocean. In coastal environments it fluctuates as a result of the introduction of freshwater runoff, direct rainfall, and evaporation. Salinities in Santa Monica Bay are relatively uniform, ranging from 33.0 to 34.0 parts per thousand (ppt) (Allan Hancock Foundation 1965).

Density

Seawater density varies inversely with temperature and directly with salinity. Water temperature is the major factor influencing density stratification in southern California since salinity is relatively uniform. As a result, density gradients are most pronounced in spring and summer. Thermoclines are often present during these parts of the year.

Dissolved Oxygen

Dissolved oxygen (DO) is utilized by aquatic plants and animals for respiration. It is replenished by gaseous exchange with the atmosphere and as a by-product of photosynthesis. Concentrations of DO in the surface waters of Santa Monica Bay range from approximately 5 to 12 milligrams per liter (mg/l) (Allan Hancock Foundation 1965). High DO values can result from increased photosynthetic activity and low values result from the decomposition of organic matter and mixing of surface waters with oxygen-poor subsurface waters.

Hydrogen Ion Concentration

The hydrogen ion concentration (pH) in the Southern California Bight varies narrowly around a mean of approximately 8.0 and decreases slightly with depth. Normal pH values in Santa Monica Bay range between 8.0 and 8.6 (Allan Hancock Foundation 1965).

BENEFICIAL USES OF RECEIVING WATERS

The California Regional Water Quality Control Board (1994) enumerated 10 beneficial uses of coastal and tidal waters in the nearshore zone of the Pacific Ocean. Of these, nine were specifically identified with the El Segundo-Scattergood area:

Industrial Service Supply

Uses which do not depend primarily on water quality such as mining, cooling water, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Water Contact Recreation

Includes all recreational uses involving body contact with water, such as swimming, wading, water skiing, skin diving, surfing, sportfishing, use in therapeutic spas, or other uses where ingestion of the water is reasonably possible.

Non-contact Water Recreation

Recreational uses which involve the presence of water, but do not necessarily require body contact, such as picnicking, sunbathing, hiking, beachcombing, camping, pleasure boating, tidepool and marine life study, hunting, and general aesthetic enjoyment.

Ocean Commercial and Sportfishing

Includes the commercial collection of fish and shellfish, including those collected for bait, plus sportfishing in the ocean, bays, estuaries, and similar non-freshwater areas.

Marine Habitat

Provides for the preservation of the marine ecosystem, including the propagation and sustenance of fish, shellfish, marine mammals, waterfowl, and marine vegetation.

Preservation of Rare and Endangered Species

Provides an aquatic habitat necessary, at least in part, for the survival of certain species established as being rare or endangered.

Navigation

Includes commercial and ocean shipping, and military (naval) operation.

Shellfish Harvesting

The collection of shellfish such as clams, oysters, abalone, shrimp, crab, and lobster for sport or commercial purposes.

Fish Spawning

Provides high quality aquatic habitat especially suitable for fish spawning.

MATERIALS AND METHODS

SCOPE OF THE MONITORING PROGRAM

The 2001 monitoring program for the El Segundo and Scattergood Generating Stations was conducted by MBC Applied Environmental Sciences (MBC) in accordance with specifications set forth in the NPDES Monitoring and Reporting Programs (Appendix A). The monitoring program included winter and summer water column profiling, summer sediment sampling for grain size and chemistry, mussel sampling for bioaccumulation, summer biological sampling for benthic infauna, and periodic impingement sampling for fish and macroinvertebrates.

STATION LOCATIONS

The locations of the monitoring stations are described in Appendix A and shown in Figure 3. The 2001 monitoring program included 12 receiving water (RW) water quality stations and eight sediment and benthic infauna (B) stations.

WATER COLUMN MONITORING

Temperature (°C), dissolved oxygen (DO), hydrogen ion concentration (pH), and salinity (ppt) were continuously measured throughout the water column during the winter and summer surveys. Sampling was conducted on both flood and ebb tides at each of the 12 receiving water monitoring stations (Figure 3). Data were obtained *in situ* using an SBE 9/17 CTD water quality profiling system (Sea-Bird), and averaged at 1.0 m intervals. In the field, the data were transferred from the Sea-Bird to floppy disk for storage. In the laboratory, data were processed using Sea-Bird proprietary software (SeaSoft ver. 4.21). The resulting information was imported into Microsoft Excel spreadsheets for further reduction and analysis.

SEDIMENT MONITORING

Sediment samples for grain size and metal chemical analyses were collected during the summer survey at eight benthic stations (Stations B1 - B8) by biologist-divers. Grain size samples were collected using a 15-cm-long, 3.5-cm-diameter, plastic core tube. Sediment samples were collected at the same time infauna samples were taken, and were transferred to jars or plastic bags for later laboratory analysis.

Sediment Grain Size

The size distributions of sediment particles were determined using two techniques: laser light diffraction to measure the amount and patterns of light scattered by a particle's surface for the sand/silt/clay fraction, and standard sieving for the gravel fraction. Laboratory data from the two

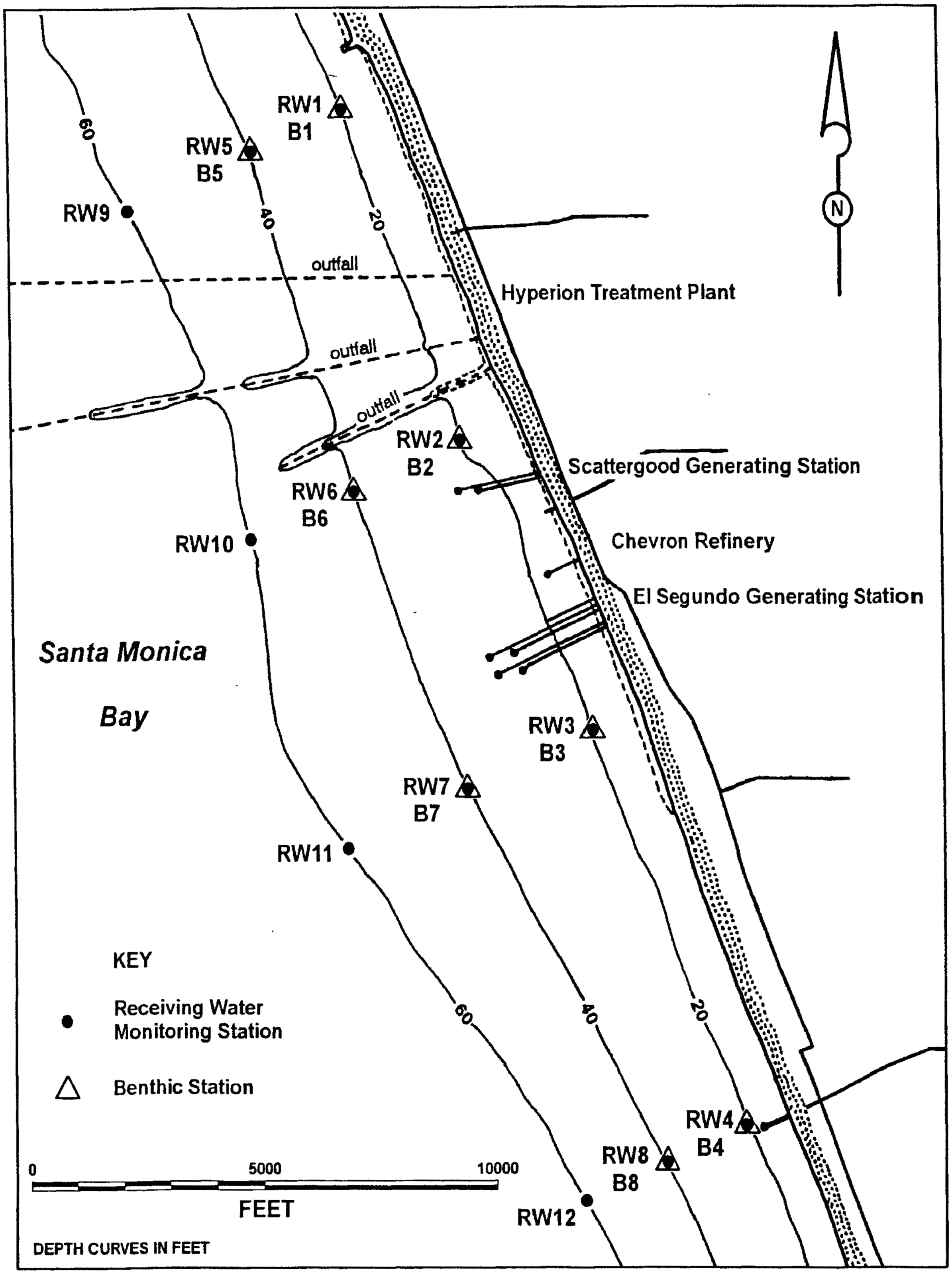


Figure 3. Location of the monitoring stations. El Segundo and Scattergood Generating Stations NPDES, 2001.

methods were combined and presented in tabular format. Resulting analyses include mean and median grain size, standard deviation of the grain size, sorting, skewness, and kurtosis. Data were plotted as size-distribution curves. Additional details are provided in Appendix B.

Sediment Chemistry

Sediment cores collected for chemical analyses were placed on ice in the field and maintained at approximately 4°C until laboratory procedures began. Sediments were analyzed for total percent solids and four metals: chromium, copper, nickel, and zinc. Environmental Protection Agency (EPA) method 160.3 was used to determine percent solids and EPA method 6010 was used for metals.

MUSSEL BIOACCUMULATION

Bay mussels (*Mylitus edulis*) were collected near the discharges by biologist-divers for bioaccumulation monitoring. One set of 45 mussels with shell lengths ranging from 47 to 57 millimeters (mm) and averaging 51.4 mm at Scattergood Generating Station and two sets of 45 mussels with shell lengths ranging from 50 to 76 mm and averaging 61.1 mm at El Segundo Generating Station, were divided into groups (replicates) of 15 mussels each and processed according to methods used in the California Mussel Watch (Appendix A and SWRCB 1986). Soft tissue from the mussels was analyzed for copper, chromium, nickel, and zinc. Results were compared to levels found in other mussel watch programs, including resident bay mussels from two reference sites, the west end of Catalina and the Manhattan Beach Pier, which were collected and analyzed concurrently with another generating station's NPDES monitoring program.

BIOLOGICAL MONITORING

The biological monitoring program consisted of benthic infauna sampling by biologists using diver-operated box corers at eight stations (Stations B1 - B8) during the summer survey. Sampling fish and macroinvertebrate populations from heat treatment impingement operations were conducted at the screenwells of the El Segundo and Scattergood Generating Stations.

Benthic Infauna

Infaunal sampling was conducted at the eight benthic stations (Figure 3), using a hand-held, diver-operated box corer (Figure 4) which collects a bottom sample of 10 cm x 10 cm x 10 cm for a total sample volume of 1.0 liter (l). The box corer is pushed into the sediment and a closing blade is swung across the mouth of the box. The core is then withdrawn from the sediment and sealed by a neoprene lid for transport to the surface.

Samples were washed in the field using a 0.5 mm stainless-steel mesh screen, labeled, and fixed in buffered 10% formalin-seawater. In the laboratory, samples were re-screened through a 0.25 mm sieve, transferred to 70% isopropyl alcohol, sorted to major taxonomic groups, identified to the lowest practical taxonomic level, and counted. Representative specimens were added to MBC's reference collection.

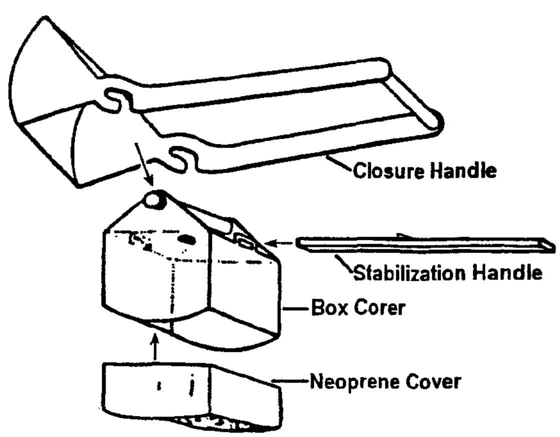


Figure 4. Diver-operated box corer used to collect infaunal samples. El Segundo and Scattergood Generating Stations NPDES, 2001.

Following identification, the weight of organisms in the major taxonomic groups in each replicate was obtained. Specimens were placed on small, pre-weighed mesh screens which had been submersed in 70% isopropyl alcohol, blotted on a paper towel, and air-dried for five minutes. Total wet weight minus screen tare weight provided the wet weight of the organisms. Large organisms were weighed separately.

Impingement

Impingement sampling is conducted during representative periods of normal operation and during all heat treatment procedures to obtain an estimate of total impingement for the year. A normal operation survey is defined as a sample of all fish and macroinvertebrates entrained by water flow into the generating station intake and subsequently impinged onto traveling screens during a 24-hr period with all circulating pumps operating, if possible. The number of operational days is usually less than 365 because of plant maintenance downtime and seasonal fluctuations in the demand for electricity, which may result in decreased water flow into the power plant. Normal operation abundance and biomass for the year are estimated by extrapolating the monitored abundance and biomass based on the percentage of the annual flow into the plant on the days sampled. Exceptions to this method are made where such extrapolations would result in exaggerated counts for species that typically occur in low abundance.

A heat treatment is an operational procedure designed to eliminate mussels, barnacles, and other fouling organisms, which grow in and occlude the generating station conduits. During a heat treatment, heated effluent water from the discharge conduit is re-entrained via cross-connecting tunnels to the intake conduit until the water temperature rises to approximately 40.5°C in the screenwells. This temperature is maintained for a period of at least one hour during which time all mussels, barnacles, and incidental fish and invertebrates living within the intake conduit and forebay succumb to the heated water. All material is subsequently impinged onto the traveling screens and removed from the forebay. The fish and macroinvertebrates are then separated from incidental debris, sorted by species, identified, and counted. Fish are measured in millimeters to either standard length (SL), total length (TL), or disc width (DW), as appropriate, and examined for external parasites, anatomical anomalies, and other abnormalities. Aggregate weights are taken by species for both fish and macroinvertebrates. Unusual specimens and those of uncertain identity are preserved in 10% formalin-seawater and returned to the laboratory for positive species determination and, if warranted, retention in the MBC collection of voucher species. Data are collected for each heat treatment survey and combined with the estimated normal operation data to determine the total impingement loss for the year.

STATISTICAL ANALYSES

Summary statistics developed from the biological data included the number of individuals (expressed as both number per grab and density), number of species and Shannon-Wiener (Shannon and Weaver 1962) species diversity (H') index. The diversity equation is as follows:

Shannon-Wiener

$$H' = -\sum_{j=1}^{S} \frac{n_j}{N} \ln \frac{n_j}{N}$$

where:

H'	=	species diversity
n_j	=	number of individuals in the j^{th} species
S	=	total number of species
N	=	toal number of individuals
j	=	each species

Data from infaunal coring collections were subjected to log transformations (when necessary) and classified (clustered) using the SYSTAT (SYSTAT ver. 5.0, Systat, Inc., Evanston, IL) clustering module (Wilkinson 1986). Cluster analysis provides a graphic representation of the relationship between species, their individual abundance, and spatial occurrence among the stations sampled. In theory, if physical conditions were identical at all stations, the biological community would be expected to be identical as well. In practice this is never the case, but it is expected that the characteristics of adjacent stations would be more similar than those distant from one another. The dendrogram shows graphically the degree of similarity (and dissimilarity) between observed characteristics and the expected average. The two-way analysis utilized in this study illustrates groupings of species and stations, as well as their relative abundance, expressed as a percent of the overall mean. Two classification analyses are performed on each set; in one (normal analysis) the sites are grouped on the basis of the species which occurred in each, and in the other (inverse analysis) the species are grouped according to their distribution among the sites. Each analysis involves three steps. The first is the calculation of an inter-entity distance (dissimilarity) matrix using Euclidean distance (Clifford and Stephenson 1975) as the measure of dissimilarity.

Clifford and Stephenson

$$D = \left[\sum_{1}^{n} (x_1 - x_2) \right]^{1/2}$$

where:

D	=	Euclidean distance between two entities
x_1	=	score for one entity
x_2	=	score for other entity
n	=	number of attributes

The second procedure, referred to as sorting, clusters the entities into a dendrogram based on their dissimilarity. The group average sorting strategy is used in construction of the dendrogram (Boesch 1977). In step three, the dendrograms from both the site and species classifications are combined into a two-way coincidence table. The relative abundance values of each species are replaced by symbols (Smith 1976) and entered into the table. In the event of extreme high abundance of a single species, abundance data are transformed using a natural log transformation [ln(x)].

DETECTION LIMITS

Detection limits (DL) used in reporting chemistry results are interpreted as the smallest amount of a given analyte that can be measured above the random noise inherent in any analytical tool. Thus, any value below the DL cannot be considered a reliable estimate of analyte concentration. Therefore, where a test for a given analyte results in a level below the DL, a "none detected" (ND) value has been assigned. The complication of what numerical value to substitute for ND in statistical calculations is addressed by EPA (1989, Section 5.3.3). When values for a given analyte are ND for all stations, then means and standard deviations will also be considered ND. However, when an analyte is detected at some stations and not at others, statistical calculations can be made by substituting ND values with either (a) zero, (b) one-half the average detection limit, or (c) the average detection limit (EPA 1989). Determining which substitution to use is based on whether or not substantial information exists to support the historical presence or absence of a given analyte at the station location. Since chemistry analyses have repeatedly resulted in ND values at the same stations through past surveys, ND values have been replaced with zeros in performing statistical calculations. This decision is also based on the fact that detection limits differ in virtually all past surveys, which would confound any yearly comparison if options (b) or (c), from above, are used. Historical raw data are presented in the appendices for possible supplementary study.

RESULTS

FIELD OPERATIONS

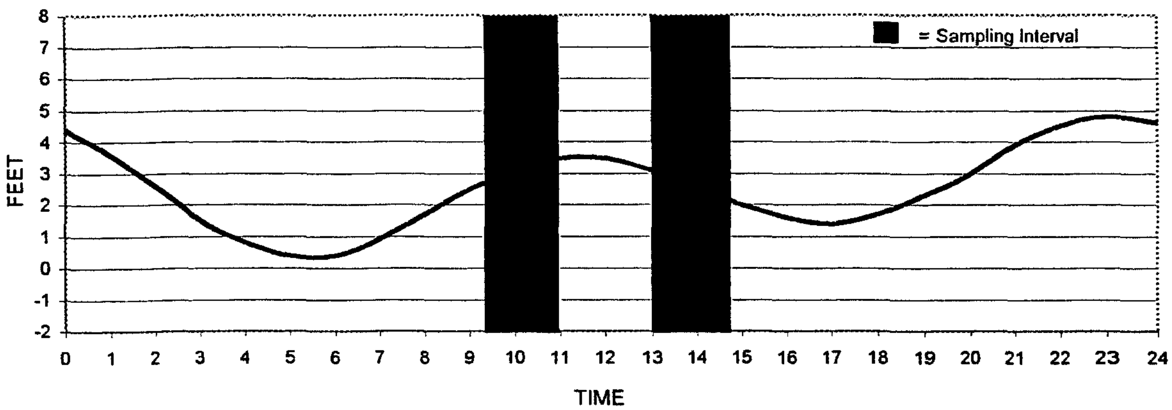
The 2001 NPDES surveys at El Segundo and Scattergood Generating Stations were conducted on 28 March, 10 August, and 20 September 2001. Latitude and longitude coordinates for water quality and benthic stations are given in Table 1.

Table 1. Latitude/longitude coordinates of sampling stations. El Segundo and Scattergood Generating Stations NPDES, 2001.

Stations			
Water Quality	Benthic	Latitude	Longitude
RW1	B1	33°56.24'	118°26.58'
RW2	B2	33°55.22'	118°26.12'
RW3	B3	33°54.27'	118°25.51'
RW4	B4	33°53.67'	118°25.33'
RW5	B5	33°56.15'	118°26.97'
RW6	B6	33°55.10'	118°26.61'
RW7	B7	33°54.09'	118°26.13'
RW8	B8	33°53.55'	118°25.78'
RW9		33°55.98'	118°27.48'
RW10		33°54.92'	118°27.05'
RW11		33°53.88'	118°26.59'
RW12		33°53.39'	118°26.22'

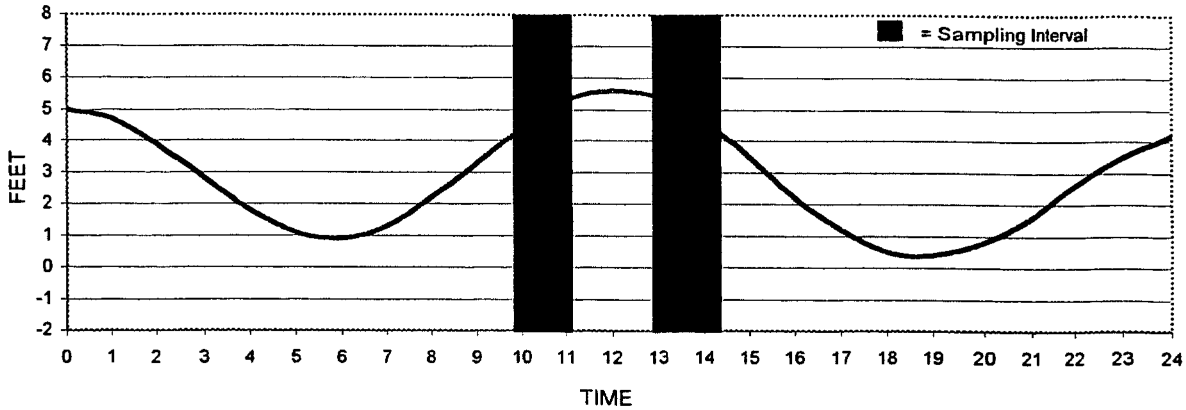
Water quality data were collected during ebb and flood tides in both winter and summer. Winter flood tide was sampled on 28 March between 0915 and 1100 hr, and ebb tide between 1300 and 1450 hr (Figure 5). During sampling skies changed from overcast to partly cloudy, with light winds variable from west to south at 2 to 5 kn. Seas were west to southwest 2 to 4 ft throughout the day. Tides ranged from a low of +0.3 ft Mean Lower Low Water (MLLW) at 0521 hr to a high of +3.5 ft MLLW at 1128 hr, and back to a low of +1.4 ft MLLW at 1651 hr. Summer flood tide was sampled on 20 September between 0950 and 1110 hr and ebb tide between 1245 and 1425 hr (Figure 6). Seas were southwest at 1 ft, with winds southwest calm to 3 kn. Skies were overcast to partly cloudy during sampling. The tide ranged from a low of +0.9 ft MLLW at 0550 hr to a high of +5.6 ft MLLW at 1205 hr, and back to a low of +0.4 ft MLLW at 1842 hr.

Infauna, grain size and sediment chemistry samples were collected by biologist-divers between 0840 and 1630 hr on 10 August. Seas were southwest at 1 to 3 ft, with southwest winds 3 to 8 kn. Skies were overcast during sampling.



Pacific Standard Time			Wednesday			March 20, 2001	
Time	Height	Time	Height	Time	Height	Time	Height
0521	0.3'	1128	3.5'	1651	1.4'	2312	4.8'

Figure 5. Tidal rhythms during water column sampling, winter survey. El Segundo and Scattergood Generating Stations NPDES, 2001.



Pacific Daylight Time		Thursday				September 20, 2001	
Time	Height	Time	Height	Time	Height	Time	Height
0550	0.9'	1205	5.6'	1842	0.4'		

Figure 6. Tidal rhythms during water column sampling, summer survey. El Segundo and Scattergood Generating Stations NPDES, 2001.

During the winter survey, no oil films, grease, floatables, turbidity, or red tide was observed. Drifting paper and plastic trash were observed at Stations RW1 and RW2. Western gulls (*Larus occidentalis*) were observed throughout the study area, and Heermann's gulls (*Larus heermanni*) were seen at Stations RW6 and RW11. Surf scoters (*Melanitta perspicillata*) were present at Stations RW2 and RW4; western grebes (*Aechmophorus occidentalis*) at Stations RW2, RW3, and RW5; and unidentified cormorants (*Phalacrocorax* sp.) at Stations RW2 and RW8. Caspian terns (*Sterna caspia*) were seen at Stations RW3 and RW8. California sea lions (*Zalophus californianus*) were observed at Station RW10, and common dolphins (*Delphinus delphis*) were seen at Stations RW3 and RW10. California brown pelicans (*Pelecanus occidentalis californicus*) were seen at Stations RW2 and RW8. No California least terns (*Sterna antillarum browni*) were observed during any component of the winter survey.

During the summer surveys, no oil films, grease, turbidity, or red tide was observed. Drift kelp (*Macrocystis pyrifera*) or seagrass (*Phyllospadix torreyi*) was seen at most stations during benthic sampling. Western and Heermann's gulls were observed throughout the study area during water quality sampling; during benthic sampling western gulls were seen at Stations RW2 and RW5, and Heermann's gulls were seen at Stations B6, B7, and B8. Western grebes were seen at Station RW2, unidentified terns at Station B7 and B8, and unidentified cormorants at Stations B7 and RW16. California sea lions were seen at Station RW9 and on buoys near Station RW10. California brown pelicans were seen at Stations B3, B5, RW1, RW2, RW3, RW6, and RW10. No California least terns were observed during any component of the summer survey.

WATER COLUMN MONITORING

Receiving water monitoring stations are shown in Figure 3. Water quality data for ebb and flood tides are summarized in Table 2 and are provided for each survey in Figures 7 through 10. Raw data are presented in Appendix C.

Temperature

In winter, mean surface water temperature during ebb tide was 16.42°C; temperatures ranged from 15.82°C at Station RW10 to 17.29°C at Station RW7 (Table 2 and Figure 7).

Temperatures during flood tide were generally cooler at the surface, with a mean surface water temperature of 15.77°C and a range from 15.45°C at Station RW6 to 16.68°C at Station RW3. The mean bottom temperature was 12.77°C during ebb tide and 13.82°C on flood tide. Bottom temperatures ranged from 11.58°C at Station RW11 to 15.35°C at Station RW2 during ebb tide and from 11.76°C at Station RW12 to 15.66°C at Station RW2 during flood tide. Temperature on flood tide decreased gradually with depth at all stations, while on ebb tide, temperatures also decreased to the bottom, but strong thermoclines were noted at 2 to 8 m. Slightly greater surface-to-bottom differences were found during ebb tide. The maximum surface-to-bottom differences recorded were 5.49°C at Station RW7 during ebb tide and 3.81°C at Station RW12 on flood tide.

Table 2. Summary of water quality parameters during ebb and flood tides. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Temp. (°C)		D.O. (mg/l)		pH		Salinity (ppt)		Temp. (°C)		D.O. (mg/l)		pH		Salinity (ppt)	
	Winter															
	Surface								Bottom							
	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood
Mean	16.42	15.77	8.48	8.33	8.11	8.09	33.21	33.22	12.77	13.82	6.14	7.13	7.85	7.94	33.47	33.37
Minimum	15.82	15.45	7.77	7.92	8.06	8.05	33.13	33.14	11.58	11.76	4.83	5.02	7.76	7.76	33.28	33.21
Maximum	17.29	16.68	9.15	8.60	8.18	8.13	33.24	33.27	15.35	15.66	8.72	8.56	8.08	8.10	33.62	33.55
	Summer															
	Surface								Bottom							
	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood	ebb	flood
Mean	20.17	20.15	7.97	7.79	8.00	8.00	33.53	33.50	15.82	15.96	7.88	7.89	7.90	7.91	33.49	33.51
Minimum	19.63	19.67	7.60	7.57	7.96	7.97	33.38	33.20	14.92	14.42	7.28	7.41	7.87	7.86	33.43	33.46
Maximum	20.48	20.42	8.19	7.98	8.02	8.02	33.57	33.58	16.94	18.27	8.43	8.34	7.94	7.95	33.63	33.56

In summer, mean surface water temperature during ebb tide was 20.17°C; temperatures ranged from 19.63°C at Station RW9 to 20.48°C at Station RW4 (Table 2). Temperature decreased with depth on both tides; however, on ebb tide the thermoclines were typically at a deeper depth (Figure 7). Surface temperatures were similar between tides, but water at mid-depth was typically warmer on ebb tide than on flood tide. Mean surface water temperature during flood tide was 20.15°C, with temperatures ranging from 19.67°C at Station RW12 to 20.42°C at Station RW3. Strong thermoclines were present at 3 to 4 m at Stations RW3 and RW4. Bottom temperatures were similar between flood and ebb tides at most stations. Near-bottom temperatures at Stations RW1 and RW3 were notably cooler on ebb tide. The mean bottom temperature during ebb tide was 15.82°C and during flood tide was 15.96°C. Bottom temperatures ranged from 14.92°C at Station RW10 to 16.94°C at Station RW2 during ebb tide, and from 14.42°C at Station RW10 to 18.27°C at Station RW3 on flood tide. The maximum surface-to-bottom difference was recorded at Station RW11 during ebb tide (5.24°C) During flood tide the maximum surface-to-bottom difference was 5.58°C at Station RW10.

Dissolved Oxygen

In winter, surface dissolved oxygen (DO) concentrations averaged 8.48 mg/l during ebb tide, ranging from 7.77 mg/l at Station RW4 to 9.15 mg/l at Station RW5 (Table 2). During flood tide, the mean surface DO concentration was 8.33 mg/l, ranging from 7.92 mg/l at Station RW3 to 8.60 mg/l at Station RW5. Surface DO levels were similar between tides at most stations with the exception of Stations RW4, RW5, RW6, and RW9, where ebb tide surface DO was about 0.5 to 1.5 mg/l higher than that during flood tide. During ebb tide, DO concentrations typically increased to 4 to 8 m then decreased rapidly to the bottom (Figure 8). During flood tide, DO concentrations among inshore stations were similar and increased slightly to the bottom; at the mid-depth and offshore stations, DO typically increased slightly to about 4 to 8 m and then decreased with depth. Flood tide bottom DO concentrations were typically 1 to 2 mg/l more than those during ebb tide. Mean surface DO was slightly higher during ebb tide, while mean bottom DO was higher during flood tide. The

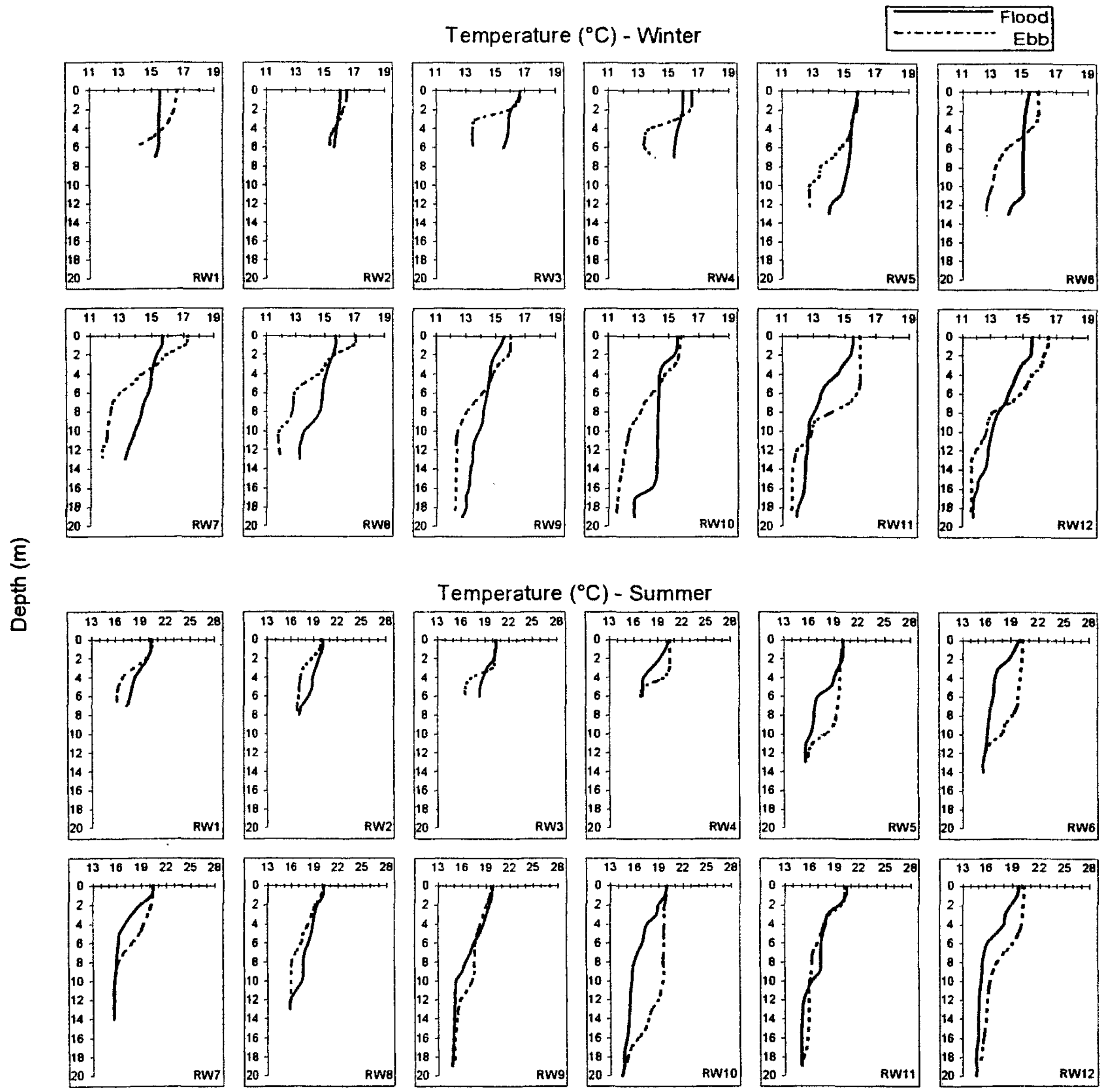


Figure 7. Temperature vertical profiles during flood and ebb tides. El Segundo and Scattergood Generating Stations NPDES, 2001.

mean bottom DO during ebb tide was 6.14 mg/l and during flood tide was 7.13 mg/l. The lowest bottom values occurred at Station RW12 on both tides, with a DO of 4.83 mg/l on ebb tide, and 5.02 mg/l on flood tide. The highest bottom value on flood and ebb tides were found at Station RW1 with concentrations of 8.56 mg/l on ebb tide and 8.72 mg/l on flood tide. The maximum surface-to-bottom difference in DO concentration occurred at Station RW10 on ebb tide, with a decrease of 3.69 mg/l and during flood tide the maximum difference was 3.39 mg/l at Station RW12. The greatest overall change in DO occurred between 9 m depth and the bottom at Station RW11 on ebb tide, with a difference of 4.25 mg/l.

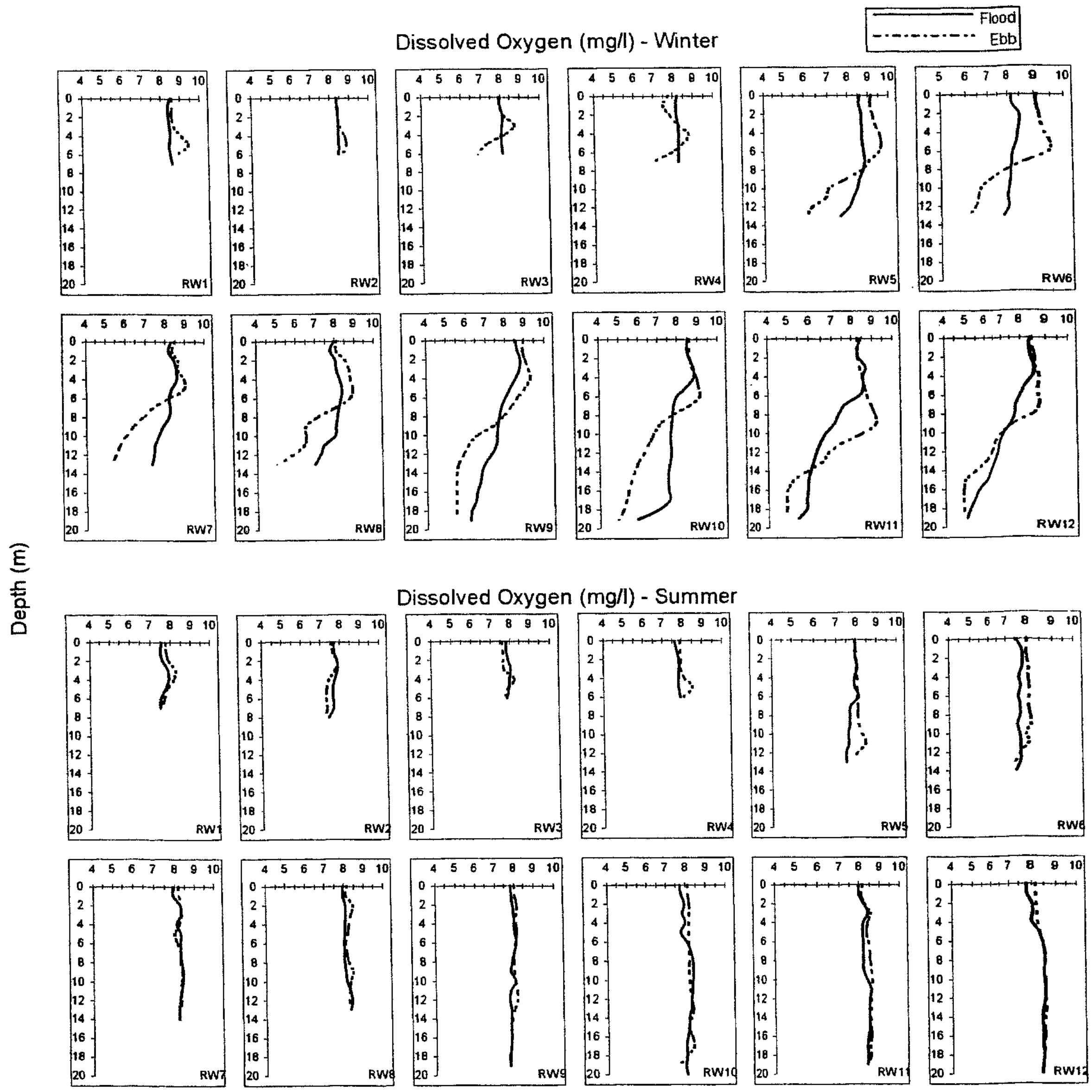


Figure 8. Dissolved oxygen vertical profiles during flood and ebb tides. El Segundo and Scattergood Generating Stations NPDES, 2001.

In summer, mean surface DO concentrations were 7.97 mg/l during ebb tide and 7.79 mg/l during flood tide (Table 2). During ebb tide, surface DO values ranged from 7.60 mg/l at Station RW2 to 8.19 mg/l at Station RW7. During flood tide, surface DO ranged from 7.57 mg/l at Station RW1 to 7.98 mg/l at Station RW11. Flood tide surface DO values were similar to, but in general slightly lower than, ebb tide measurements (Figure 8). The greatest difference occurred at Station RW6, with a 0.44 mg/l difference between tides. During both tides, DO values were mixed with five stations with surface DO higher than bottom, and six stations with bottom DO higher. At Station RW10, flood tide values were higher at the bottom, and ebb tide at the surface. Mean bottom DO concentrations were 7.88 mg/l during ebb tide and 7.89 mg/l during flood tide (Table 2). During ebb tide, bottom DO values ranged from 7.28 mg/l at Station RW2 to 8.43 mg/l at Station RW12. During flood tide, bottom DO ranged from 7.41 mg/l at Station RW2 to 8.34 mg/l at Station RW11. Maximum DO values were typically found at mid-depth. Below the mid-depth maximum, DO generally decreased with increasing depth. Profiles were similar among stations, with the greatest surface-to-bottom difference of 0.56 mg/l at Station RW6 on ebb tide and 0.53 mg/l at Station RW12 on flood tide. The largest decline below the maximum was 0.73 mg/l on ebb tide at Station RW10 between the mid-water DO concentration peak at 13 m and the bottom.

Hydrogen Ion Concentration

In winter, hydrogen ion concentration (pH) at the surface averaged 8.11 during ebb tide, differing less than 0.07 from the values at all stations (Table 2). During flood tide, mean surface pH was 8.09, with values varying 0.04 or less at all stations. Values generally decreased with depth and were typically lower on ebb tide in the water column below 2 to 6 m (Figure 9). The maximum surface-to-bottom difference was 0.55 at Station RW10 on ebb tide.

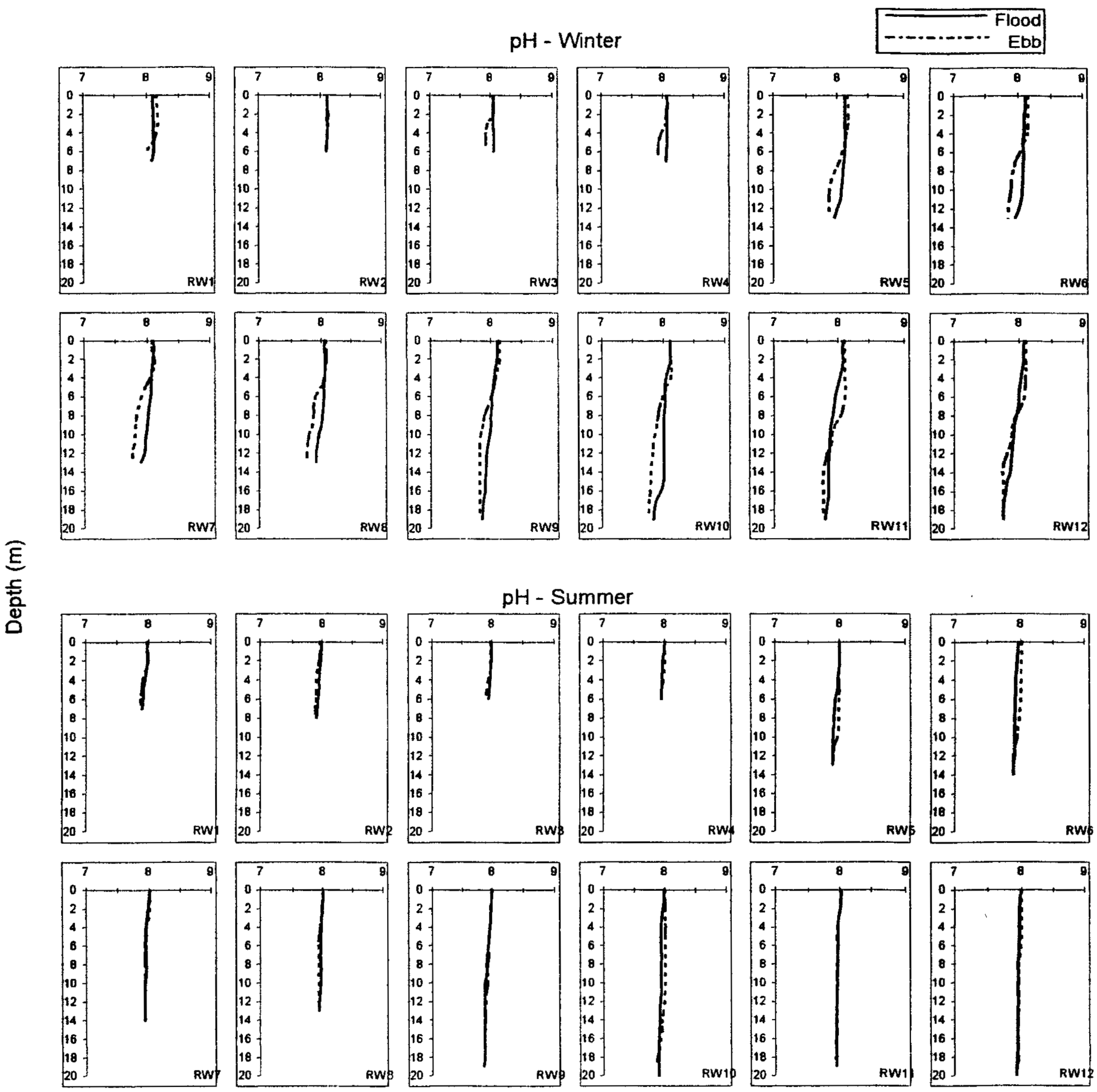


Figure 9. Hydrogen ion concentration (pH) vertical profiles during flood and ebb tides. El Segundo and Scattergood Generating Stations NPDES, 2001.

In summer, mean surface pH was 8.00 during both tides, with values differing from the mean 0.04 or less on either tide (Table 2). At all stations, pH levels were nearly identical throughout the water column averaging 7.90 on ebb tide and 7.91 on flood tide (Figure 9). A maximum difference of 0.14 was found between tides and among stations.

Salinity Concentration

In winter, salinity concentration at the surface averaged 33.21 parts per thousand (ppt) during ebb tide and was nearly identical (33.22 ppt) during flood tide, differing less than 0.08 ppt from the average at all stations on both tides (Figure 10, Table 2). Values generally increased with depth at mid-depth and deeper stations, but was more variable at the inshore stations. With the exception of Station RW9, ebb tide values were typically higher at depth and generally exhibited

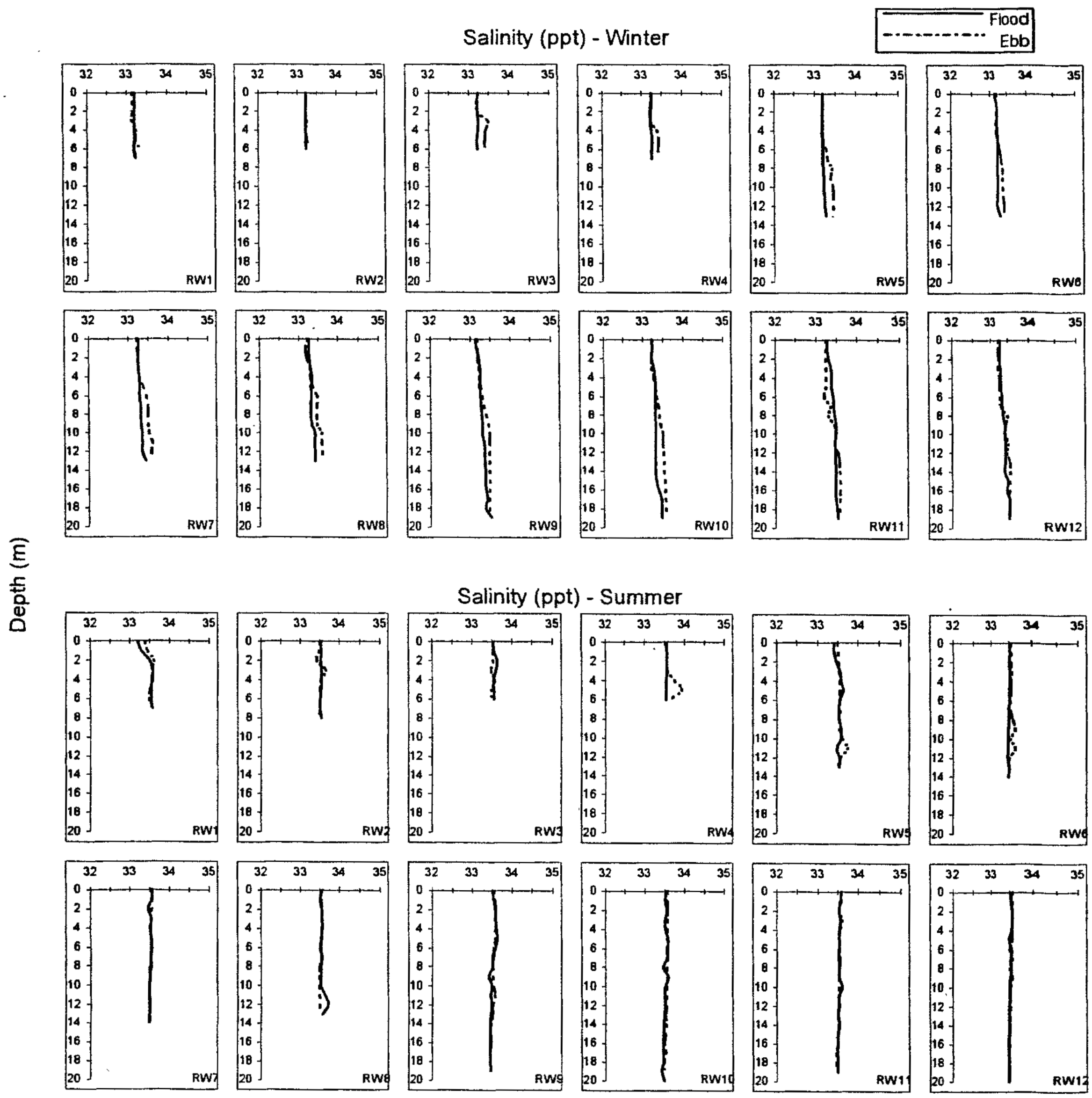


Figure 10. Salinity vertical profiles during flood and ebb tides. El Segundo and Scattergood Generating Stations NPDES, 2001.

small haloclines at 3 to 6 m depth (Figure 10). The maximum surface-to-bottom difference was 0.40 ppt at Station RW8 on ebb tide and 0.39 ppt at Station RW9 on flood tide. Salinity at the bottom averaged 33.47 ppt on ebb tide and 33.37 ppt on flood tide and varied by 0.22 ppt between tides and 0.41 ppt among stations.

In summer, mean surface salinity was 33.53 ppt on ebb tide and nearly identical (33.50 ppt) during flood tide, with values differing from the mean by 0.3 ppt or less on either tide (Table 2). Salinity levels were generally identical through the water column on both tides; however, at the inshore stations a halocline was noted at 0 to 4 m depth on ebb tide and slightly deeper at the mid-depth stations, while tiny excursions were noted at the deep stations (Figure 10). Mean bottom salinity was again nearly identical between tides with 33.49 ppt on ebb tide and 33.51 ppt on flood tide. A maximum difference of 0.18 ppt was found between tides and 0.54 ppt among stations.

SEDIMENT MONITORING

Sediment Grain Size

Particle size distribution curves for each station are presented in Appendix D and sediment grain size parameters are summarized in Table 3. Grain size is expressed in phi (Φ) units, which are inversely related to grain diameter.

In 2001, sediments at all stations were composed primarily of sand with smaller amounts of silt and clay (Table 3). Overall, samples from the eight stations averaged 89% sand, 10% silt, and 1% clay, with an average mean grain size of 2.46 phi (182 µm, fine sand). Sediments were finest at inshore Station B2 (upcoast of the Scattergood discharge structure at a depth of 20 ft), where mean grain size was 3.62 phi (81 µm). Coarsest sediments were collected from offshore Station B5 (upcoast of the Scattergood discharge at a depth of 40 ft), where mean grain size was 0.73 phi (604 µm). Sediments at the nearshore stations averaged 83% sand, with a mean grain size of 3.01 phi (124 µm) while sediments at the offshore stations averaged 96% sand, with a mean grain size of 2.06 phi (239 µm).

Table 3. Sediment grain size parameters. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Nearshore					Offshore					Overall	
Parameter	B1	B2	B3	B4	Mean	B5	B6	B7	B8	Mean	Mean	S.D.
% Gravel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Sand	75.03	61.42	98.21	95.96	82.66	98.62	92.67	95.57	95.43	95.57	89.11	13.52
% Silt	23.07	36.07	1.34	3.19	15.92	1.21	5.83	3.28	3.16	3.37	9.64	12.86
% Clay	1.90	2.51	0.45	0.85	1.43	0.17	1.50	1.15	1.41	1.06	1.24	0.76
Mean grain size												
phi	3.58	3.62	2.39	2.82	3.01	0.73	3.15	3.06	3.04	2.06	2.46	0.92
µm	83	81	191	142	124.3	604	112	120	121	239.3	181.8	174.1
Sorting (ϕ)	0.68	1.20	0.64	0.59	0.78	0.91	0.53	0.46	0.49	0.60	0.69	0.25
Skewness	0.14	0.06	-0.02	0.03	0.05	-0.08	0.17	0.07	0.03	0.05	0.05	0.08
Kurtosis	1.12	1.01	1.02	1.10	1.06	1.12	1.27	1.14	1.18	1.18	1.12	0.08

Sorting, a measure of the spread of the particle distribution curve, averaged 0.69 phi overall, indicating moderately well sorted sediments (Table 3). Sorting values ranged from 0.46 phi (well sorted) at offshore Station B7 to 1.20 phi (poorly sorted) at nearshore Station B2. Poorly sorted sediments are composed of a broad range of particle size classes, while well sorted sediments contain only a few size classes.

Skewness and kurtosis tell how closely the grain size distribution approaches the normal Gaussian probability curve. More extreme skewness and kurtosis values indicate non-normal

Skewness and kurtosis indicates how closely the grain size distribution approaches the normal Gaussian probability curve. More extreme skewness and kurtosis values indicate non-normal distributions. Skewness is a measure of the symmetry of the particle distribution curve; a value of zero indicates a symmetrical distribution of fine and coarse materials around the mode of the curve, while a value greater than zero (positive) indicates an excess of fine material, and a negative value indicates an excess of coarse material. Sediments at all stations were slightly skewed; average skewness was 0.05 (Table 3). Sediments at Station B3 were the most evenly distributed with a skewness of -0.02, indicating a slightly greater amount of coarse material in the sediments (Appendix D). The greatest skewness was 0.17, found at Station B6.

Kurtosis is a measure of the peakedness of the particle distribution curve. A kurtosis value of 1.00 represents a normal particle distribution curve. Kurtosis values at all stations were greater than 1.00, indicating leptokurtic (excessively peaked) distributions, with dominance by a narrow range of particle sizes (Table 3). Kurtosis values were lowest at the nearshore stations, while highest kurtosis occurred at Station B6.

Sediment Chemistry

Concentrations of metals found in sediments at each station are presented in Appendix E and are summarized in Table 4. In 2001, concentrations of all metals were highest at inshore Stations B1 and B2 (Table 4). Lowest concentrations of chromium, copper, and zinc were detected at nearshore Station B3, and lowest nickel concentration occurred at offshore Station B5. Overall, chromium concentrations ranged from 9.4 to 24 mg/kg, copper from less than 1.6 to 8.8 mg/kg, nickel from 3.1 to 13 mg/kg, and zinc ranged from 12 to 48 mg/kg.

Table 4. Sediment metal concentrations (mg/dry kg). El Segundo and Scattergood Generating Stations NPDES, 2001.

	Station								Survey			Detection
Metal	B1	B2	B3	B4	B5	B6	B7	B8	Mean	S.D.	ERL	Level
Chromium	24	24	9.4	13	9.8	18	18	17	16.7	5.7	81	1.6 - 1.9
Copper	6.0	8.8	ND	2.0	2.6	5.1	4.1	2.4	3.9	2.7	34	1.6 - 1.9
Nickel	12	13	5.0	6.6	3.1	9.0	8.8	8.0	8.2	3.3	21	1.6 - 1.9
Zinc	38	48	12	17	17	23	21	17	24.1	12.4	150	8.1 - 9.3

ND = Below the detection limit (for calculations ND = 0)
ERL = Effects Range Low

MUSSEL BIOACCUMULATION

In 2001, forty-five (45) bay mussels (*Mytilus edulis*) each were collected from the Scattergood discharge structure and from each of the El Segundo Units 1 & 2 and Units 3 & 4 discharge structures.

Copper was detected in four of the six replicate samples of bay mussel tissue collected from the El Segundo Units 1&2 and 3&4 discharge and all three replicates from the Scattergood discharge structure (Table 5, Appendix F). Zinc was detected in all replicates from both El Segundo and Scattergood discharge structures locations. Mean concentration of copper, where detected, was 6.4 mg/dry kg at El Segundo and 9.8 mg/dry kg at Scattergood. Mean concentration of zinc was 68 mg/dry kg at El Segundo and 51.3 mg/dry kg at Scattergood. Chromium and nickel were not detected in any of the replicates.

Table 5. Bay mussel tissue metal concentrations (mg/dry kg). Scattergood and El Segundo Generating Stations NPDES, 2001.

	Replicate						Detection
Metal	1	2	3	Mean	S.D.	ERL	Limit
ESGS Units 1 & 2 Discharge							
Chromium	ND	ND	ND	ND	-	81	3.7 - 5.0
Copper	ND	ND	3.9	1.3	2.3	34	3.7 - 5.0
Nickel	ND	ND	ND	ND	-	21	3.7 - 5.0
Zinc	70	54	47	57	11.8	150	18 - 25
ESGS Units 3 & 4 Discharge							
Chromium	ND	ND	ND	ND	-	81	4.5 - 4.9
Copper	7.7	8.2	5.7	7.2	1.3	34	4.5 - 4.9
Nickel	ND	ND	ND	ND	-	21	4.5 - 4.9
Zinc	78	75	84	79	4.6	150	23 - 24
SGS Discharge							
Chromium	ND	ND	ND	ND	-	81	4.7 - 5.8
Copper	8.7	9.6	11	9.8	1.2	34	4.7 - 5.8
Nickel	ND	ND	ND	ND	-	21	4.7 - 5.8
Zinc	65	46	43	51	11.9	150	24 - 29
Pier Reference Site (Manhattan Beach Pier)							
Chromium	ND	ND	ND	ND	-	81	4.5 - 5.2
Copper	ND	5	6	4	3.2	34	4.5 - 5.2
Nickel	ND	ND	ND	ND	-	21	4.5 - 5.2
Zinc	45	68	48	54	12.5	150	23 - 26
Catalina (west end) Reference Site							
Chromium	ND	ND	ND	ND	-	81	7.4 - 9.5
Copper	13	16	16	15	1.7	34	7.4 - 9.5
Nickel	ND	ND	ND	ND	-	21	7.4 - 9.5
Zinc	270	170	250	230	52.9	150	28 - 47

ND = Below the detection limit (for calculations ND = 0)
ERL = Effects Range Low

BIOLOGICAL MONITORING

Benthic Infauna

Results of infaunal analyses for 2001 are presented by station and replicate in Appendix G and are summarized in Tables 6, 7, and 8 and Figure 11.

Species Composition. A total of 3,884 infaunal organisms representing 196 species and 12 phyla were collected during the summer survey (Table 6, Appendix G-1). Annelida was the most abundant phylum, but was second in species richness, accounting for almost 55% of the individuals but only slightly more than 31% of the species. The phylum Arthropoda was second most abundant, accounting for nearly 28% of the individuals, but was first in species richness with almost 38% of the species. Mollusca was the third most abundant phylum, comprising more than 17% of individuals and almost 11% of the species. Nemertea represented 3.6% of the species but only about 2.0% of the individuals, while Echinodermata represented 2.6% of the species and 0.2% of the abundance. The eight remaining phyla together represented less than 2% of the individuals and 8% of the species. Three phyla, Brachiopoda, Sipuncula, and Nematoda, were represented by only one species each; only one individual of Brachiopoda and Sipuncula occurred in the samples. Arthropods, mollusks, and echinoderms were generally more abundant and speciose offshore than nearshore; the exception was the high abundance of mollusks at Station B2.

Number of Species. Species richness averaged 58 species per station and ranged from 21 species at Station B3 to 80 species at Station B5 (Table 7). Species richness was higher at offshore stations (an average of 73 species per station) than at nearshore stations (an average of 43 species). Nearshore, species richness was highest at Stations B1 and B2, both upcoast of the

Table 6. Number of infaunal species and individuals by phylum. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Nearshore				Offshore					Percent
Parameter	B1	B2	B3	B4	B5	B6	B7	B8	Total	Total
Number of species										
Arthropoda	12	11	9	14	26	22	21	24	74	37.76
Annelida	23	20	6	15	36	34	21	29	61	31.12
Mollusca	8	16	2	5	6	9	14	11	34	17.35
Nemertea	3	4	2	3	4	3	3	3	7	3.57
Cnidaria	-	-	-	2	1	-	-	2	5	2.55
Echinodermata	4	1	1	-	3	2	2	2	5	2.55
Chordata	1	1	-	1	2	1	1	1	3	1.53
Phorona	1	-	-	-	-	1	1	2	2	1.02
Platyhelminthes	2	1	-	1	1	1	-	-	2	1.02
Brachiopoda	-	-	-	-	-	1	-	-	1	0.51
Nematoda	-	-	1	1	1	1	-	-	1	0.51
Sipuncula	-	-	-	-	-	-	1	-	1	0.51
Total	54	54	21	42	80	75	64	74	196	
Number of individuals										
Annelida	521	476	54	635	138	109	83	109	2125	54.71
Arthropoda	35	62	58	91	127	132	225	341	1071	27.57
Mollusca	26	85	2	11	65	85	89	60	423	10.89
Echinodermata	10	1	2	-	56	45	31	2	147	3.78
Nemertea	12	11	10	17	8	4	8	4	74	1.91
Chordata	4	1	-	1	5	1	2	2	16	0.41
Cnidaria	-	-	-	4	1	-	-	2	7	0.18
Nematoda	-	-	1	1	3	2	-	-	7	0.18
Platyhelminthes	3	1	-	1	1	1	-	-	7	0.18
Phorona	1	-	-	-	-	1	1	2	5	0.13
Brachiopoda	-	-	-	-	-	1	-	-	1	0.03
Sipuncula	-	-	-	-	-	-	1	-	1	0.03
Total	612	637	127	761	404	381	440	522	3884	

Table 7. Infaunal community parameters. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Nearshore				Offshore					
Parameter	B1	B2	B3	B4	B5	B6	B7	B8	Total	Mean
Number of species										
Total	54	54	21	42	80	75	64	74	196	58.0
Rep. Mean	23.8	28.0	10.8	19.3	33.3	34.3	30.0	34.5		
Rep. S.D.	4.0	2.6	2.5	4.2	10.2	3.1	5.0	4.5		
Number of individuals										
Total	612	637	127	761	404	381	440	522	3884	485.5
Rep. Mean	153.0	159.3	31.8	190.3	101.0	95.3	110.0	51.5		
Rep. S.D.	39.4	66.0	7.5	78.4	41.7	15.1	7.0	25.1		
Diversity (H')										
Total	1.48	2.26	1.76	1.12	3.54	3.35	3.14	3.20	3.19	2.48
Rep. Mean	1.40	2.19	1.50	1.09	2.95	2.95	2.76	2.87		
Rep. S.D.	0.48	0.48	0.28	0.35	0.23	0.18	0.16	0.34		
Biomass (g)										
Total	1.40	6.49	0.64	0.79	1.55	1.64	1.02	1.85	15.38	1.92
Rep. Mean	0.35	1.62	0.16	0.20	0.39	0.41	0.26	0.46		
Rep. S.D.	0.06	0.36	0.13	0.09	0.29	0.22	0.13	0.24		

Table 8. The 18 most abundant infauna species. El Segundo and Scattergood Generating Stations NPDES, 2001.

		Nearshore				Offshore					Percent	Cum.
Phy	Species	B1	B2	B3	B4	B5	B6	B7	B8	Total	Total	Percent
AN	*Apoprionospio pygmaea*	453	313	40	599	4	24	31	32	1496	38.5	38.5
AR	*Diastylopsis tenuis*	17	12	-	-	1	10	79	123	242	6.2	44.7
MO	*Tellina modesta*	15	47	-	4	2	68	54	40	230	5.9	50.7
EC	*Dendraster excentricus*	4	-	2	-	52	44	30	-	132	3.4	54.1
AR	*Rhepoxynius abronius*	-	-	-	-	0	37	35	30	102	2.6	56.7
AR	*Mandibulophoxus gilesi*	-	-	34	55	0	-	-	-	89	2.3	59.0
AR	*Rhepoxynius menziesi*	5	-	-	1	0	8	36	31	81	2.1	61.1
AR	*Jassa slatteryi*	-	29	6	7	0	-	6	25	73	1.9	63.0
AN	*Prionospio (Minuspio) lighti*	4	59	-	-	0	-	-	-	63	1.6	64.6
AR	*Ampelisca agassizi*	-	-	-	-	0	3	23	34	60	1.5	66.1
AN	*Spiophanes bombyx*	7	5	-	7	1	16	12	10	58	1.5	67.6
AR	*Americhelidium shoemakeri*	-	1	2	13	10	14	7	9	56	1.4	69.1
AN	*Mediomastus acutus*	7	20	5	3	0	6	5	7	53	1.4	70.4
AR	*Gibberosus myersi*	-	-	-	2	0	2	10	28	42	1.1	71.5
AR	*Rudilemboides stenopropodus*	-	-	-	-	42	-	-	-	42	1.1	72.6
AN	*Pectinaria californiensis*	13	23	-	-	1	1	-	3	41	1.1	73.6
MO	*Solamen columbianum*	-	-	-	-	40	-	-	-	40	1.0	74.7
AR	*Argissa hamatipes*	-	-	-	-	12	23	3	-	38	1.0	75.6

AN = Annelida; AR = Arthropoda; MO = Mollusca; EC = Echinodermata; NE = Nemertea

Scattergood Generating Station, and lowest at Station B3, immediately downcoast of the El Segundo Generating Station. Offshore, species richness was greatest furthest upcoast and lowest downcoast.

Abundance and Density. Abundance averaged 486 individuals per station and ranged from 127 individuals at Station B3 to 761 individuals at Station B4, nearshore and immediately downcoast of El Segundo Generating Station (Table 7). Density averaged 12,138 individuals/m^2, and ranged from 3,175 individuals/m^2 to 19,025 individuals/m^2. On average, abundance and density were greater nearshore (534 individuals per station and 13,356 individuals/m^2, respectively) than offshore (437 individuals per station and 10,919 individuals/m^2, respectively). The high abundance values at Stations B1, B2, and B4 were due to large numbers (453, 313, and 599, respectively) of the polychaete annelid *Apoprionospio pygmaea* (Table 8). Abundance of this species at Station B3 and at the offshore stations ranged from 4 at Station B5 to 40 at Station B3.

Species Diversity. Shannon-Wiener species diversity index (H') values totaled 3.19 and averaged 2.48 per station, and ranged from 1.12 at Station B4 to 3.54 at Station B5 (Table 7). The value at Station B4 was particularly low because of the overwhelming numerical dominance of the community by *Apoprionospio pygmaea*. All of the offshore station values were greater than any of the nearshore station values.

Biomass. Biomass averaged 1.92 g per station, or 48 g/m^2. Biomass was highest at Station B2 (6.49 g, or 162.25 g/m^2) due to the occurrence of the annelid *Apoprionospio pygmaea* and a mollusk (Table 7, Appendices G-3 and G-4). Biomass was lowest at Station B3 (0.64 g). Biomass at the nearshore stations was generally less than that at the offshore stations, however the greatest biomass was taken at a nearshore station.

Community Composition. The 18 most abundant species, those which each comprised 1% or more of the total abundance, accounted for almost 76% of all the organisms collected (Table 8). The most abundant species, the annelid worm *Apoprionospio pygmaea*, accounted for almost 39% of all individuals taken. Next most abundant was the annelid worm *Diastylopsis tenuis*, comprising more than 6% of the individuals and taken at 6 of the 8 stations. Third most abundant with almost 6% of the abundance was the mollusk *Tellina modesta*, which occurred throughout most of the study area. The Pacific sand dollar (*Dendraster excentricus*) occurred in greater numbers offshore, while the three amphipods *Rhepoxynius abronius*, *Mandibulophoxus gilesi*, and

Rhepoxynius menziesi were relatively abundant comprising 2.6, 2.3, and 2.1% of the individuals, respectively. Both of the *Rhepoxynius* congeners were found in greater abundance offshore, whereas the amphipod *Mandibulophoxus gilesi* was found exclusively at onshore Stations B3 and B4 (Table 8).

Cluster Analysis. Results of cluster analysis (classification) of the 18 most abundant infaunal species (Table 8) are presented in Figure 11.

Normal (site) analysis clustered the eight stations into three groups (Figure 13). Group I contains offshore Stations B6, B7, B8, where several of the more abundant species occurred in relatively equal concentrations. Group II included all of the nearshore stations (Stations B1, B2, B3, and B4); the top species were very abundant at most of these stations and other species occurred in similar abundance. Group III included only the offshore, upcoast Station B5, where several other species were more abundant, and a few were less abundant than the other offshore stations.

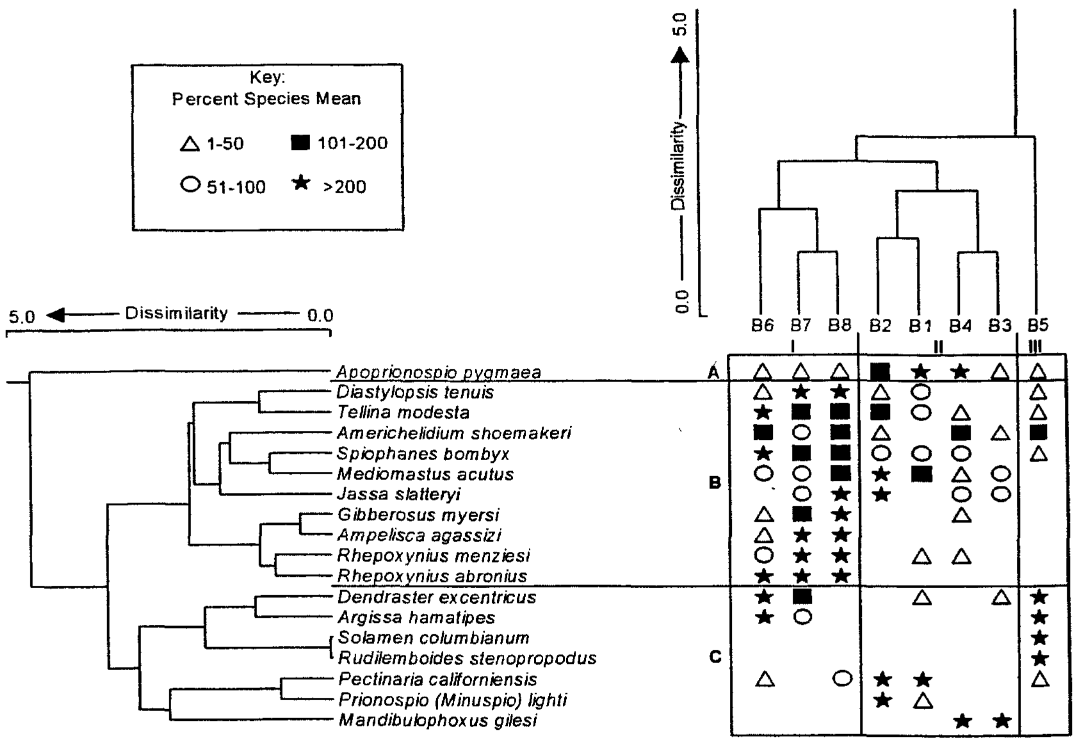


Figure 11. Two-way coincidence table resulting from normal (station) and inverse (species) classification dendrograms for the 18 most abundant infaunal species. El Segundo and Scattergood Generating Stations NPDES, 2001.

Inverse (species) analysis clustered the dominant species into three species groups. Group A included only the amphipod *Apoprionospio pygmaea*, which was widely distributed. Group B included very abundant species at the offshore stations and moderately abundant species which occurred at several stations in the inshore area. Group C comprised the remaining seven species, which typically were very abundant at only one station and did not occur at several stations.

Impingement

Results from heat treatment and normal operation surveys of fish entrained and impinged at El Segundo Generating Station and from heat treatment surveys at Scattergood Generating Station during the 2001 sampling year (1 October 2000 To 30 September 2001) are presented in the following text. Data are summarized in Tables 9 through 12 and presented in their entirety in Appendix H. Fish and macroinvertebrate data are presented separately for each generating station.

Fish

Species Composition. In total, 57 species representing two classes and 30 families of fish were taken at the two generating stations (Appendix H-1).

El Segundo. Heat treatment and normal operation surveys at Units 1 & 2 yielded 35 species of fish representing two classes and 21 families (Appendices H-1 and H-2). Four families of cartilaginous fish (Elasmobranchiomorphi = Chondrichthyes) and 17 families of bony fish (Osteichthyes) were dominated by five species each of surfperch in the family Embiotocidae and croakers in the family Sciaenidae. Heat treatment and normal operation surveys at El Segundo Generating Station Units 3 & 4 yielded 36 species of fish representing two classes and 22 families (Appendices H-1and H-2). Four families of cartilaginous fish and 18 families of bony fish were dominated by six species of surfperch and four species of croakers. A total of 45 species were taken at El Segundo Generating Station (Table 9); nine species were unique to Units 1 & 2, and 10 species were unique to Units 3 & 4.

Table 9. Number of individuals and biomass (kg) of the 10 most abundant fish species impinged during heat treatments at El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2		Units 3 & 4		Total	Percent	Cumulative	Total
Species	No.	Wt. (kg)	No.	Wt. (kg)	Abundance	Total	Percent	Biomass
queenfish	495	18.633	1512	41.886	2007	42.4	42.4	60.52
northern anchovy	794	8.166	9	0.043	803	17.0	59.4	8.21
salema	-	-	343	20.650	343	7.2	66.6	20.65
walleye surfperch	83	5.131	219	7.946	302	6.4	73.0	13.08
sargo	137	79.946	137	58.647	274	5.8	78.8	138.59
kelp bass	72	47.150	76	32.480	148	3.1	81.9	79.63
jacksmelt	53	3.693	66	7.705	119	2.5	84.4	11.40
blacksmith	20	1.154	92	7.686	112	2.4	86.8	8.84
shiner perch	-	-	87	0.836	87	1.8	88.6	0.84
white seaperch	31	5.207	34	3.257	65	1.4	90.0	8.46
Survey Totals	1937	368.31	2797	268.81	4734			637.12
Total Species	35		36		45			

Scattergood. Heat treatment surveys at Scattergood Generating Station yielded 47 species of fish, representing two classes and 26 families (Table 10, Appendices H-1 and H-3). Five families of cartilaginous fish and 21 families of bony fish were dominated by six species each of croakers and surfperch.

Table 10. Number of individuals and biomass (kg) of the five most abundant fish species impinged during heat treatments at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

			Percent		Cumulative Percent	
Common Name	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
Pacific sardine	19932	671.37	50.8	31.6	50.8	31.6
queenfish	10620	312.62	27.1	14.7	77.8	46.4
topsmelt	3793	105.92	9.7	5.0	87.5	51.3
jacksmelt	2766	277.63	7.0	13.1	94.5	64.4
white croaker	589	30.95	1.5	1.5	96.0	65.9
Survey Totals	39256	2122.87				
Total Species	47					

Abundance. An estimated total of 43,990 individual fish were taken at the two generating stations; 39,256 fish (89.2%) were taken from Scattergood Generating Station and 4,734 (10.8%) from El Segundo Generating Station (Tables 9 and 10, Appendices H-2 and H-3).

El Segundo. There were 1,732 individuals taken during three heat treatments at Units 1 & 2, and 2,673 individuals taken at four heat treatments at Units 3 & 4 (Table 11, Appendix H-4). Catch per heat treatment at the Units 1 & 2 screenwell averaged 577 individuals and 20 species, and ranged from 164 individuals and 17 species (1 February 2001) to 1,291 individuals (30 April 01) and 22 species (22 December 2000 and 30 April 2001). Extrapolated abundance based on the intake flow during the six normal operation surveys indicated approximately 205 fish were impinged during the year, giving an estimated total of 1,937 individuals and 35 species taken at El Segundo Generating Station Units 1 & 2 (Appendix H-5). Catch per heat treatment at the Units 3 & 4 screenwell averaged 668 individuals and 20 species, and ranged from 82 individuals and 10 species (26 August 2001) to 1,265 individuals (8 July 2001) and 24 species (7 October 2000 and 8 July 2001). Extrapolated abundance based on the intake flow during the 10 normal operation surveys indicated that approximately 124 fish were impinged during the year, giving an estimated total of 2,797 individuals and 36 species taken at El Segundo Generating Station Units 3 & 4 (Appendix H-6). The combined abundance at El Segundo Generating Station was an estimated 4,734 individuals of 45 species (Table 9, Appendix H-2).

Table 11. Number of species, number of individuals, and biomass (kg) of fish impinged during heat treatments at El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

Date			Number: Species	Number: Individuals	Biomass
Units 1 & 2					
22	Dec	00	22	277	51.81
1	Feb	01	17	164	73.73
30	Apr	01	22	1291	112.47
Total			34	1732	238.00
Mean			20	577	79.33
Units 3 & 4					
7	Oct	00	24	707	115.43
28	Jan	01	23	619	45.82
8	Jul	01	24	1265	87.72
26	Aug	01	10	82	8.08
Total			36	2673	257.04
Mean			20	668	64.26

Queenfish (*Seriphus politus*) was the most abundant species overall, accounting for 42.9% (2,007) of the individuals; it was the most abundant species at Units 3 & 4, and second in abundance at Units 1 & 2 (Table 9). Northern anchovy (*Engraulis mordax*), second in overall abundance, was first in abundance at Units 1 & 2, while it ranked 17th at Units 3 & 4. The second, third, and fourth most abundant species overall were salema (*Xenistius californiensis*), walleye surfperch (*Hyperprosopon argenteum*), and sargo (*Anisotremus davidsonii*) which contributed 7.3%, 6.5%, and 5.9% to the overall abundance, respectively. Kelp bass (*Paralabrax clathratus*), jacksmelt (*Atherinopsis californiensis*), blacksmith (*Chromis punctipinnis*), shiner perch (*Cymatogaster aggregata*), and white seaperch (*Phanerodon furcatus*) were the sixth through tenth, respectively, most abundant fish overall. These five species accounted for 11.3% of the combined abundance. The 10 most abundant species at El Segundo Generating Station accounted for 91.1% of all individuals taken. The remaining 35 species accounted for 531 individuals and less than 9% of the abundance. Of the top ten most abundant species overall, most of the species had similar ranks at Units 3 & 4; two of these species, salema and shiner perch, were not taken at Units 1 & 2. Other species among the ten most abundant at Units 1 & 2 were California scorpionfish (*Scorpaena guttata*), California halibut (*Paralichthys californicus*), and horn shark (*Heterodontus francisci*). Other species among the ten most abundant at Units 3 and 4 were barred sand bass (*Paralabrax nebulifer*) and black croaker (*Cheilotrema saturnum*).

Scattergood. Five heat treatments were conducted at Scattergood Generating Station, with the catch per heat treatment averaging 7,851 individuals and 26 species (Table 12). The catch ranged from 2,059 individuals and 17 species (27 March 2001) to 24,910 individuals and 32 species (14 November 2000) (Table 12, Appendix H-3).

Pacific sardine (*Sardinops sagax*) was the most abundant species, accounting for 50.8% (19,932 individuals) of the abundance, followed by queenfish, with 27.1% (10,620 individuals) of the abundance (Table 10). The third, fourth, and fifth most abundant species were topsmelt (*Atherinops affinis*), jacksmelt, and white croaker (*Genyonemus lineatus*) which contributed 9.7%, 7.1%, and 1.5% to the abundance, respectively. The five most abundant species at Scattergood Generating Station accounted for 96.0% of all the individuals taken at the station (Table 10). The remaining 27 species totaled 1,556 individuals and accounted for only 4.0% of the abundance.

Biomass. Biomass totaled 2,759.99 kg for fish impinged at both stations (Tables 9 and 10). Scattergood Generating Station accounted for 76.9% (2,122.87 kg) of the overall total and El Segundo Generating Station accounted for 23.1% (637.12 kg).

El Segundo. Fish biomass totaled 238.0 kg during the heat treatment surveys at El Segundo Generating Station Units 1 & 2, and 257.04 kg at the heat treatment surveys at Units 3 & 4 (Table 11, Appendix H-7). Biomass at Units 1 & 2 heat treatments averaged 79.3 kg, and ranged from 51.8 kg (22 December 2000) to 112.5 kg (30 April 2001), and at Units 3 & 4 averaged 64.3 kg, ranging from 8.1 kg (26 August 2001) to 115.4 kg (7 October 2000) (Table 11). Combined with normal operation surveys, estimated fish biomass totaled 637.1 kg at El Segundo Generating Station in 2001 (Appendix H-2). The eight species ranked highest in biomass at El Segundo Generating Station were, in order, horn shark, sargo, kelp bass, queenfish, bat ray (*Myliobatis californica*), salema, opaleye (*Girella nigricans*), and walleye surfperch. Individually, these species contributed greater than 2% to the biomass, and collectively, these eight species amassed a weight of 502.95 kg or 78.9% of the biomass at El Segundo Generating Station (Appendix H-2). Other species ranked high in biomass at Units 1 & 2 were northern anchovy, swell shark (*Cephaloscyllium ventriosum*), and California sheephead (*Semicossyphus pulcher*). At Units 3 & 4, other highly ranked species were barred sand bass and jacksmelt.

Scattergood. In 2001 fish biomass totaled 2,122.87 kg during the five heat treatment surveys at Scattergood Generating Station (Table 12, Appendix H-8). Biomass averaged 424.6 kg per survey and ranged from 97.4 kg (27 March 2001) to 1,117.6 kg (14 November 2000). Pacific sardine accounted for 31.6% of the biomass; this species and the next five highest ranking species (bat ray, queenfish, jacksmelt, topsmelt, and barred sand bass) accounted for 88.9% (1,887.6 kg) of the total biomass (Appendix H-8). Four of these six species were among the six most abundant species.

Table 12. Number of species, number of individuals, and biomass (kg) of fish impinged during heat treatments at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

Date			Number		Biomass
			Species	Individuals	
14	Nov	00	32	24910	1117.57
2	Jan	01	29	4777	198.70
27	Mar	01	17	2059	97.43
14	Jul	01	26	3726	526.27
26	Aug	01	25	3784	182.90
Total			47	39256	2122.87
Mean			26	7851	424.57

Size (Length). Standard length (SL), total length (TL), or disk width (DW), where appropriate, were measured in mm for up to 200 individuals of each species impinged during heat treatment and normal operation surveys.

Population Structure. Length-frequency histograms were constructed for one of the more abundant forage species, queenfish, and two species of sport fishing importance, kelp bass and barred sand bass. These species were sufficiently abundant at one or both of the stations to construct meaningful histograms, which were utilized to determine if the intake selectively entrained particular size classes. These histograms do not necessarily reflect the composition of the offshore population.

Queenfish was one of the most numerous fish taken in 2001. It was most frequently entrained at the 110 to 150 mm SL size range at the two generating stations. At El Segundo Generating Station there were three mode, at 70, 100 and 130 mm SL (Figure 12). At Scattergood Generating Station, there was a single mode at 130 mm SL.

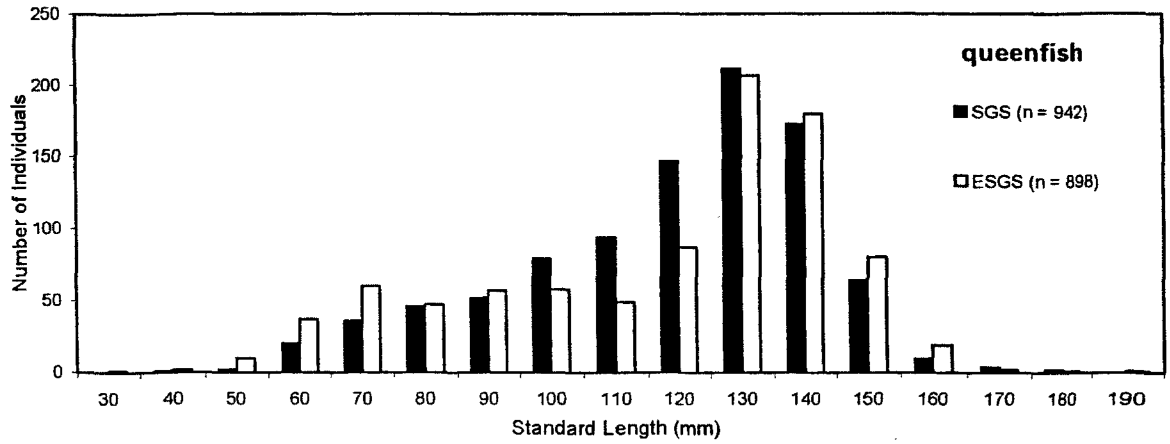


Figure 12. Length-frequency distribution of queenfish (*Seriphus politus*) taken during impingement surveys. El Segundo and Scattergood Generating Stations NPDES, 2001.

Kelp bass size distribution indicated a single mode in the population at El Segundo Generating Station, with two modes at Scattergood Generating Station. Distribution at El Segundo Generating Station peaked at 230 mm SL; distribution at Scattergood Generating Station peaked at 80 and 160 mm SL (Figure 13). At El Segundo Generating Station most of the individuals were between 200 and 310 mm SL, and at Scattergood Generating Station most were less than 100 mm SL. Kelp bass were more abundant at El Segundo Generating Station.

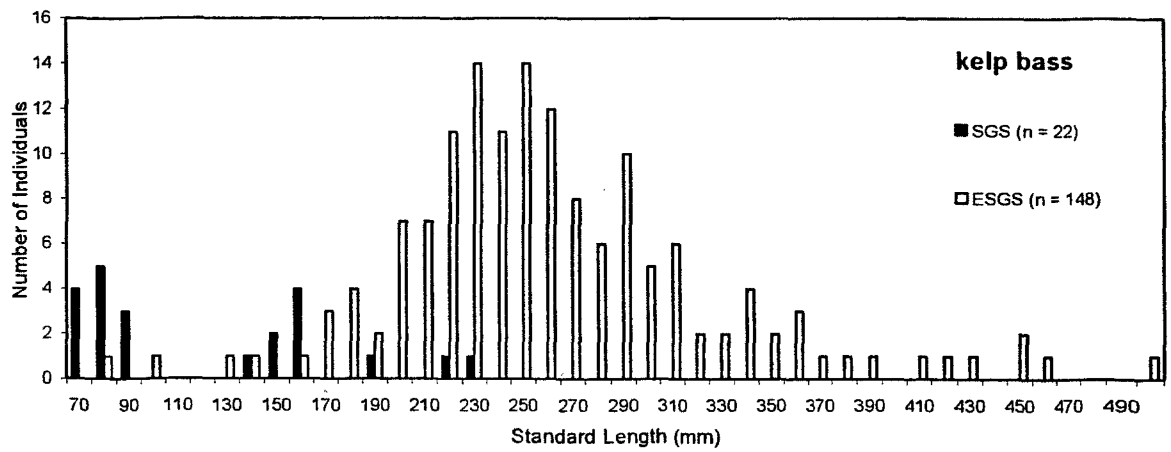


Figure 13. Length-frequency distribution of kelp bass (*Paralabrax clathratus*) taken during impingement surveys. El Segundo and Scattergood Generating Stations NPDES, 2001.

Barred sand bass size distribution indicated a single mode in the populations at both El Segundo Generating Station and Scattergood Generating Station. Distribution at El Segundo Generating Station peaked at 210 mm SL; at Scattergood Generating Station the population peaked at 230 mm SL (Figure 14). At El Segundo Generating Station most of the individuals were between 190 and 310 mm SL, and at Scattergood Generating Station most were between 200 and 240 mm SL. Barred sand bass were more abundant at Scattergood Generating Station.

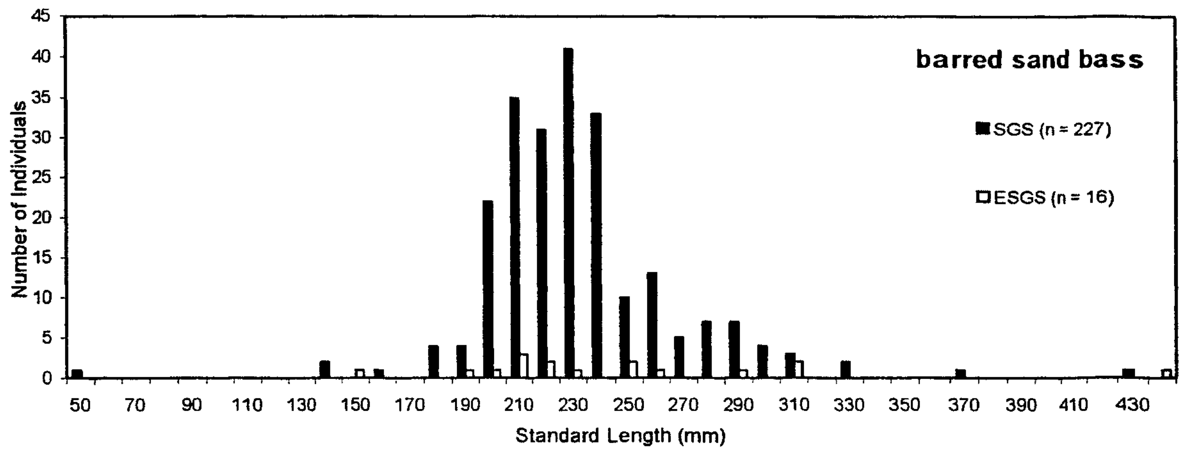


Figure 14. Length-frequency distribution of sand bass (*Paralabrax nebulifer*) taken during impingement surveys. El Segundo and Scattergood Generating Stations NPDES, 2001.

Diseases and Abnormalities. No diseases were noted on any fish caught during the impingement surveys. However, during the July heat treatment at Scattergood Generating Station, two bat rays were missing all or part of their tails, and a species of parasitic fish lice, *Elthusa* (=*Lironeca*) sp., was present on a salema.

Macroinvertebrates

El Segundo. Fourteen motile macroinvertebrate species, with an estimated abundance of 32,419 individuals and a biomass of 1,569.2 kg were collected during heat treatment and normal operation surveys at El Segundo Generating Station (Table 13, Appendices H-9 through H-13). These species represented four phyla and 10 families, and included nine species of arthropods (all crustaceans), two species each of echinoderms and mollusks, and one cnidarian (Appendix H-1).

Table 13. Number of individuals and biomass (kg) of the five most abundant macroinvertebrates impinged during heat treatments at El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2		Units 3 & 4		Total	Percent	Cumulative	Total
Species	Abund.	Biomass	Abund.	Biomass	Abundance	Total	Percent	Biomass
Pacific rock crab	15049	145.23	12617	629.85	27666	85.34	85.34	775.08
yellow rock crab	512	16.11	1129	45.92	1641	5.06	90.40	62.03
graceful rock crab	22	0.05	876	36.45	898	2.77	93.17	36.50
purple jellyfish	3	2.70	736	461.77	739	2.28	95.45	464.47
tuberculate pear crab	37	0.03	478	1.19	515	1.59	97.04	1.22
Survey totals	15929	256.75	16490	1312.46	32419			1569.21
Total species	10		13		14			

Pacific rock crab (*Cancer antennarius*) dominated the catch, with 85.3% of the abundance and 49.4% of the biomass. The second and third most abundant species were also rock crabs, yellow rock crab (*Cancer anthonyi*) and graceful rock crab (*Cancer gracilis*), with 5.1% and 2.8% of the abundance, respectively. The species with the second greatest biomass (29.6%), purple jellyfish (*Pelagia colorata*), was fourth in abundance. Together with tuberculate pear crab (*Pyromaia tuberculata*), the top five abundant species accounted for over 97% of the individuals. Including

California spiny lobster (*Panulirus interruptus*), the three species with the greatest biomass accounted for over 90% of the total biomass.

Scattergood. Twenty-one motile macroinvertebrate species, comprised of 2,941 individuals with a biomass of 2,122.9 kg were collected during heat treatment surveys at Scattergood Generating Station (Table 14, Appendices H-14 and H-15). These species represented three phyla and 12 families, and included 16 species of arthropods (all crustaceans), three species of mollusks, and two species of echinoderms (Appendix H-1).

Table 14. Number of individuals and biomass (kg) of the five most abundant macroinvertebrate species impinged at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

			Percent		Cumulative Percent	
Common Name	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
red striped shrimp	824	671.37	28.02	31.63	28.02	31.63
yellow rock crab	730	312.62	24.82	14.73	52.84	46.35
graceful rock crab	535	105.92	18.19	4.99	71.03	51.34
intertidal coastal shrimp	218	277.63	7.41	13.08	78.44	64.42
California spiny lobster	205	30.95	6.97	1.46	85.41	65.88
Survey Totals	2941	2122.87				
Total Species	21					

The most abundant invertebrate species was red rock shrimp (*Lysmata californica*), which accounted for 28.0% of the overall abundance, and 31.6% of the biomass (Table 14, Appendices H-14 and H-15). The second and third most abundant species, yellow rock crab and graceful rock crab, contributed 24.8% and 18.2% to the abundance, respectively, and 14.7% and 5.0%, respectively, to the biomass. Together with intertidal coastal shrimp (*Heptacarpus palpator*) and California spiny lobster, the fourth and fifth most abundant species, the five most abundant species accounted for over 85% of the individuals, and almost 66% of the biomass.

Because of the sport and commercial importance of California spiny lobster, carapace lengths (CL) were measured to determine the size frequency of entrained individuals. This species was sufficiently abundant to construct a length-frequency histogram of catches from both El Segundo Generating Station and Scattergood Generating Station (Figure 15). Abundance of entrained and impinged California spiny lobster was greater at El Segundo Generating Station than at Scattergood Generating Station. At El Segundo Generating Station the distribution was bimodal, with peaks at 70 and 100 mm CL; Scattergood Generating Station had a single mode, with a peak at 70 mm CL. Legal size for commercial and sport take is 83 mm CL.

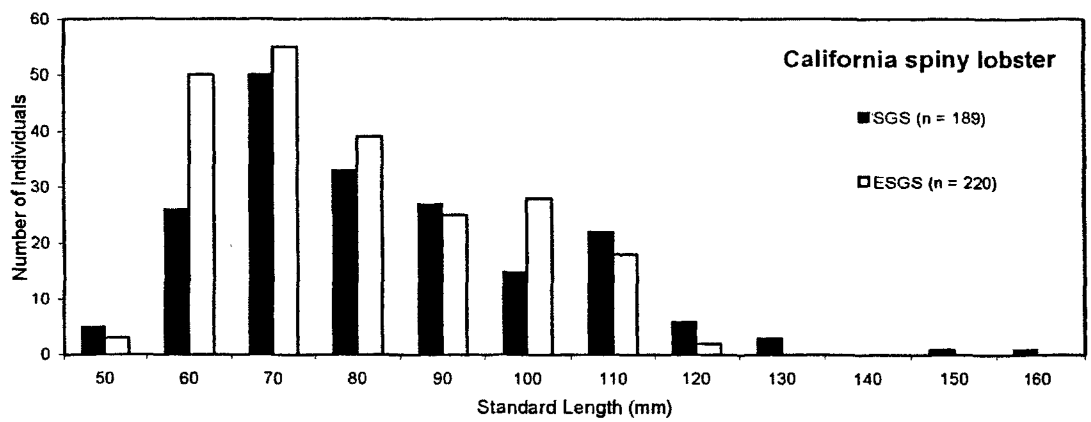


Figure 15. Length-frequency (carapace length) distribution of California spiny lobster (*Panulirus interruptus*) taken during impingement surveys. El Segundo and Scattergood Generating Stations NPDES, 2001.

DISCUSSION

WATER COLUMN MONITORING

In winter, inshore temperatures at the two stations closest to the discharges (RW2 and RW3) were nearly identical to temperatures at the upcoast and downcoast controls (Stations RW1 and RW4) on ebb tide and varied by less than 1°C on flood tide. On ebb tide, temperatures were generally higher at all stations probably due to solar insolation of the surface waters and there was a temperature differential of about 1.5°C at mid-depth downcoast Stations RW7 and RW8. In summer, surface temperatures were typically higher than in winter. Surface temperatures were similar between tides at all other stations. During the summer surveys, surface ambient temperature did not vary by more than 1°C on either tide throughout the study area. During both surveys, elevations of less than 1.5°C were noted between stations and tides in the study area. These were probably related to solar insolation. Thermal fields from generating station discharges were not detected at any stations during either survey. The greatest surface-to-bottom temperature differences were found at the 40-ft depth stations in winter and the deepest (offshore) stations in summer. All temperatures fell within ranges found in previous surveys (MBC 1990-2000).

The concentration of dissolved oxygen in seawater is affected by physical, chemical, and biological variables. High DO concentrations may result from cool water temperatures (solubility of oxygen in water increases as temperature decreases), active photosynthesis, and/or mixing at the air-water interface (Sverdrup et al. 1942). Conversely, low concentrations may result from warm water temperatures, high rates of organic decomposition, and/or extensive mixing of surface waters with oxygen-poor subsurface waters.

During the winter surveys, dissolved oxygen profiles were variable and corresponded to temperature profiles among stations and between tides. This direct correspondence of DO to temperature has been noted during previous sampling in the area (MBC 1997, 1999, 2000). Surface DO concentrations during the winter survey were, in general, about 0.5 mg/l higher than at the same stations during the summer survey. Dissolved oxygen concentrations generally increased with depth and a drop in temperature, as would be expected, during the winter survey. In summer, DO profiles varied for the first few meters and then were nearly vertical indicating very little mixing in the water column. All dissolved oxygen concentrations were well within the range of previously reported values (MBC 1990-2000). Dissolved oxygen concentrations in the study area appeared to be unaffected by the generating stations' discharges.

Hydrogen ion concentration (pH) varied only slightly with depth. Values were within ranges considered normal in the study area and were similar to values previously reported in the study area (MBC 1990-2000). In the open ocean, hydrogen ion concentration (pH) remains fairly constant due to the buffering capacity of seawater (Sverdrup et al. 1942). However, in nearshore areas, pH may be more variable due to physical, chemical, and biological influences. For instance, in areas with large organic influx, such as bays, estuaries, and river mouths, microbial decomposition is greater than in offshore areas. Along with a reduction in dissolved oxygen, decomposition also results in the production of humic acids, which decrease pH (Duxbury and Duxbury 1984). Reduced pH values may also occur in areas of freshwater influx, since freshwater usually has a lower pH than saltwater. In contrast, phytoplankton blooms, which are often associated with nearshore upwelling, may increase pH. High photosynthetic rates increase the removal of carbon dioxide from water, thus reducing the carbonic acid concentration and raising pH.

Salinity in the open ocean is generally 35 parts per thousand (ppt); that is, a 1,000-g sample of ocean water contains 35 g of dissolved compounds, collectively referred to as salts (Sverdrup et al. 1942). In nearshore areas subjected to freshwater influx, however, salinity is usually slightly lower. In southern California, salinity of nearshore waters is generally between 33 and 34 ppt (Dailey et al. 1993). Reductions in nearshore salinity usually result from freshwater input, while slight increases are often associated with upwelling of colder, more saline bottom waters.

Salinity concentrations were slightly lower in winter than in summer (less than 0.5 ppt) and were nearly identical throughout the water column and the study area. Slight excursions were noted in summer at the surface at Station RW1 and at depth at Stations RW4, RW5, RW6, and RW8. It is probable that the later excursions are the result of differing water masses moving into the area as noted in the temperature profiles. The reason for the slight depression on flood tide at the surface at Station RW1 is unknown.

SEDIMENT MONITORING

Sediment Grain Size

In 2001, sediments were coarsest at Station B5, located upcoast of the Scattergood and El Segundo discharges on the 40-ft isobath, while finest sediments occurred at Stations B1 and B2, upcoast of the discharges at a depth of 20 ft. Mean particle size at Station B5 was five times (or greater) that at the other offshore stations. Mean grain size was the coarsest since 1990 due to the highly coarse sediments at Station B5 (Figure 16) (MBC 1990-1994, 1997-2000). Finest sediments have usually occurred at offshore Station B5, except in 1999 and the present study, when sediments at that station were much coarser than at all other stations. This year, the coarse sediments at Station B5 appeared to be relict red sand. Red sands were historically deposited at lower sea level stands, and represent ancient beaches or dunes that have been re-exposed by currents (Terry et al. 1956, Emery 1960). In Santa Monica Bay, these sands are found in a narrow band along the nearshore subtidal northwest of Palos Verdes Hills, in smaller nearshore patches stretching from El Segundo north past Marina del Rey, and further offshore just inside the shelf break (Emery 1960, MBC 2001). The sediments get their color from a thin stain of ferric oxide.

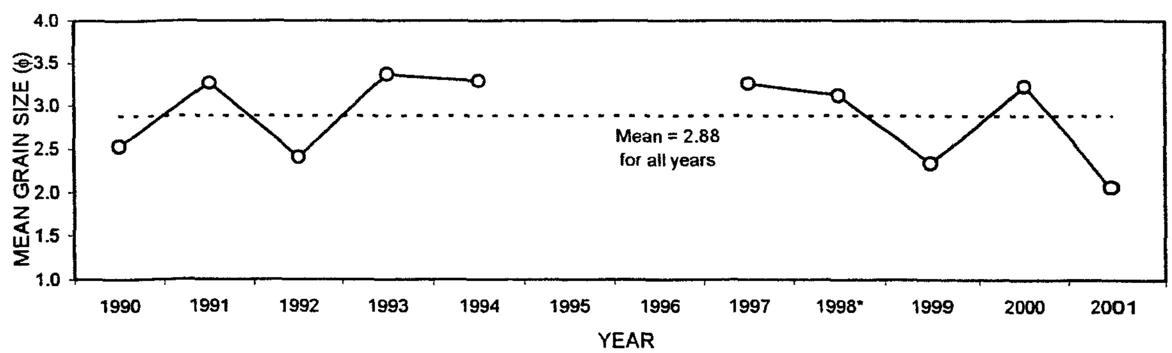


Figure 16. Comparison of sediment mean grain size, 1990 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Percentage of silt at Station B2 in 2001 was the highest from any station in the last 10 years (Appendix D). Since 1990, highest silt percentages have generally occurred at Stations B2 and B5. Sediments in the study area are typically coarsest nearshore; greater turbulence and currents nearshore suspend finer particles which are deposited further offshore in calmer water. Sediment composition and distribution in the study area are likely primarily affected by natural causes, such as sediment transport, deposition from Ballona Creek, which enters Santa Monica Bay approximately two miles north of Station B1, and nearshore currents. Littoral currents in the study area move up to eight feet per second, and are capable of transporting beach sediments alongshore (Drake and Gorsline 1973). Dikes, groins, and jetties in the study area were constructed to facilitate sand accumulation; otherwise, beach sands tend to move toward Redondo Canyon and offshore

(MBC 1988). Results from the 2001 survey indicate no apparent patterns in sediment grain size relative to the discharges of the El Segundo and Scattergood Generating Stations.

Sediment Chemistry

Highest concentrations of chromium, copper, nickel, and zinc occurred at Stations B1 and B2 in 2001. Lowest concentrations of chromium, copper, and zinc were found at Station B3, and lowest nickel concentration was found at Station B5. Differences in metal concentrations among sites are often directly related to the amount of fine-grained material in the sediment. Fine-grained sediments may contain higher amounts of metals due to the greater available surface area (Ackermann 1980, de Groot et al. 1982). Therefore, comparisons should take into account the relative amounts of fine and coarse sediments.

Since 1990, highest metal levels have usually occurred at Stations B2 and B5, both upcoast from the El Segundo and Scattergood Generating Stations (Figure 17). From 1990 to 1993, percentages of fine sediments and metal levels were highest at Station B5. In 1993, the percentage of "fines" (silt and clay combined) increased at Station B2, and consequently the metal levels at Station B2 increased from among the lowest to levels typical at Station B5. In 1994, the highest percentage of fine sediments and, in general, the highest levels of metals were found at Station B2. To a lesser degree, percent fines and metals at Station B1, upcoast of Station B2, followed a similar pattern of increase from 1993 to 1997. In 1997, the highest percentage of fines and the corresponding comparatively high level of metals occurred at Station B5, but in 1998, 1999, and again in 2001, highest metal concentrations occurred at Station B2, the station with the largest amount of fine material. Similar concentrations of chromium were detected at Stations B1 and B2 in 2001; the second highest percentage of silt and clay was collected at Station B1 in 2001. Overall, sediment metal concentrations in 2001 were similar to values recorded in the study area since 1990 (MBC 1990-1994, 1997-2000).

All values observed in 2001 were within the range found in sediments within the Southern California Bight and were lower than or comparable to levels found by the National Oceanographic and Atmospheric Administration (NOAA) at other sandy, offshore sites in southern California (NOAA 1991a). Elevated sediment metal levels may be toxic to some organisms. Ranges of toxicity have been developed by NOAA (NOAA 1991b) and later updated (Long et al. 1995) using data from spiked sediment bioassays, sediment-water equilibrium partitioning, and the co-occurrence of adversely affected fauna and contaminant levels in the field. Chemical concentrations believed to be associated with adverse biological effects from the various independent studies were compared for each parameter. The lower 10 percentile was designated as the "Effects Range-Low" (ERL). The median of concentration levels was designated the "Effects Range-Median" (ERM). Since 1990, sediment metal concentrations in the study area have been well below the determined concentrations for low effects, which are 81 mg/kg for chromium, 34 mg/kg for copper, 20.9 mg/kg for nickel, and 150 mg/kg for zinc (Figure 17).

The wide distribution of metals in the study area does not appear to be related to the generating station discharges; more likely it is due to non-point source discharges, such as storm drains that carry street runoff into Santa Monica Bay (NOAA 1991c). Ballona Creek, to the north, could also be a source of fine sediments and their associated metal contaminants. There are several other potential sources of metals in the El Segundo area, as well, such as boating-related activities in Marina del Rey, nearby oil refineries, and the City of Los Angeles Hyperion Treatment Plant (MBC 1993b). The Hyperion Treatment Plant 5-mile discharge is 8,300 m from shore at a depth of 57 m. In 1997, City of Los Angeles Hyperion treatment plant discharged an estimated 0.65 metric tons (mt) of chromium, 17 mt of copper, 4.1 mt of nickel, and 20 mt of zinc into Santa Monica Bay (Raco-Rands and Steinberger 1998). These emissions represent between 1% and 19% of what was discharged 20 years earlier (in 1977) from the same outfall (Schafer 1978).

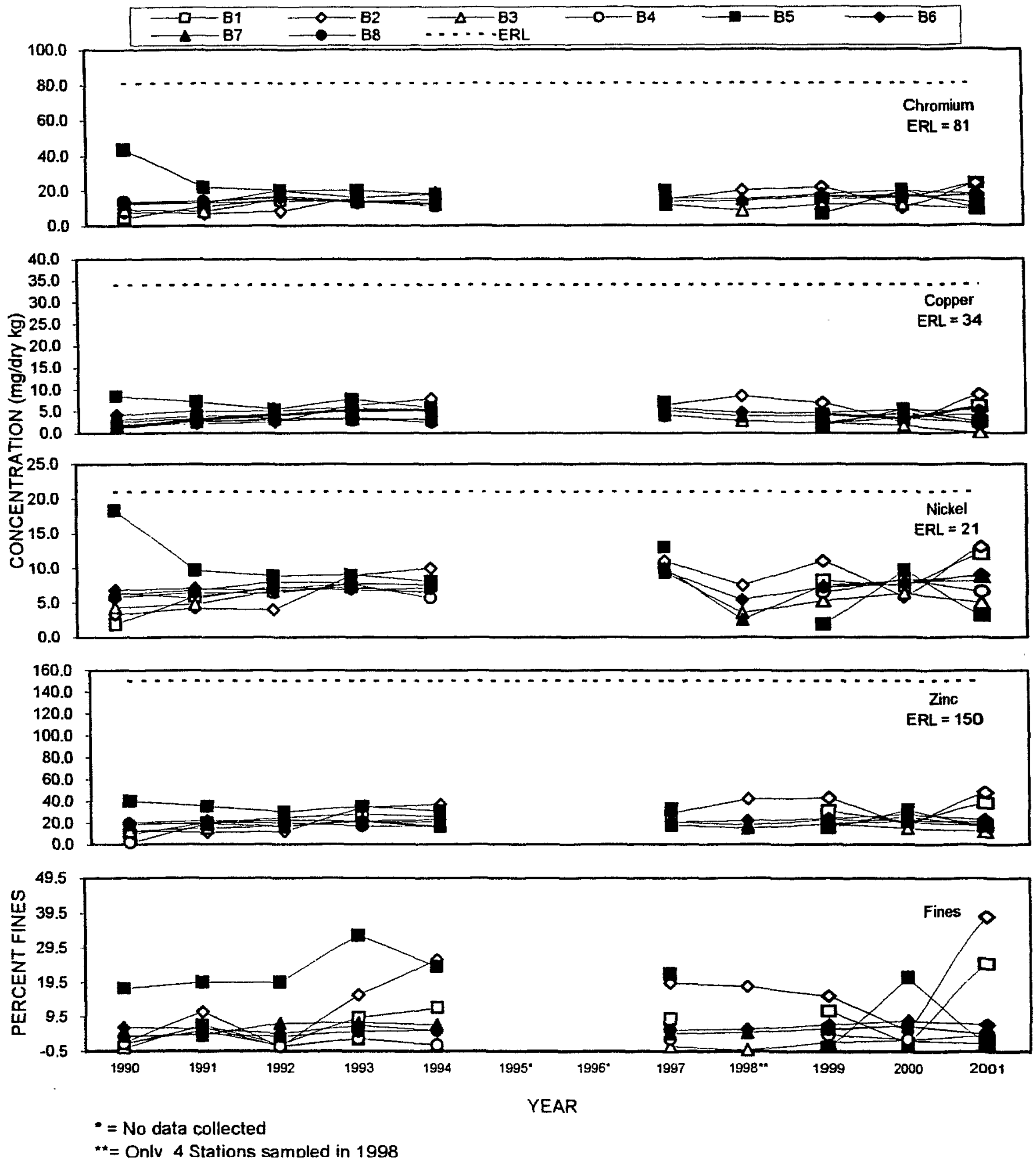


Figure 17. Comparison of sediment metal concentrations and percent fines by station,1990 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Concentrations of chromium, copper, nickel, and zinc in Santa Monica Bay as a whole are significantly higher than concentrations found in the Southern California Bight, even though the mean percent fines are similar (42.5% in the Bight versus 44.8% in Santa Monica Bay) (Schiff 1998). Results from the 1994 Southern California Bight Pilot Project indicate 50% of the area in Santa Monica Bay contained sediments with at least one constituent that exceeded the ERM. For comparison, only 7% of the area sampled outside the Bay contained sediment concentrations exceeding an ERM.

In 2001, little difference was seen between metal levels found at nearshore and offshore stations, and no extremely high or low values were noted in sediments at stations nearest the discharges. Highest metal concentrations occurred at Station B2, where the greatest amount of silt and clay occurred. As in past surveys, the distribution of metals in the study area appears to be related to localized sediment grain size. There is no indication that operation of the generating stations has had an appreciable effect on sediment metal concentrations in the study area.

MUSSEL BIOACCUMULATION

In 2001, bay mussels were collected from the study area for analysis of tissue metal concentrations.

Bay mussel tissue collected from the El Segundo 1&2 and 3&4 discharge structures in 2001 had detectable levels of copper and zinc. Mean copper concentration in 2001 from El Segundo was much lower than in 2000 and 1999. In 1999, copper concentration was highest of the six surveys performed since 1990 and three times higher than the mean concentration found in the 1994 study (Figure 18) (MBC 1990-1994, 1999). Mean zinc concentration in 2001 was also lower, about one-half the concentration noted in 1999, and similar to values recorded in 1992 and 1993. Chromium and nickel have not been detected in mussel tissue in the study area since the 1990 NPDES surveys.

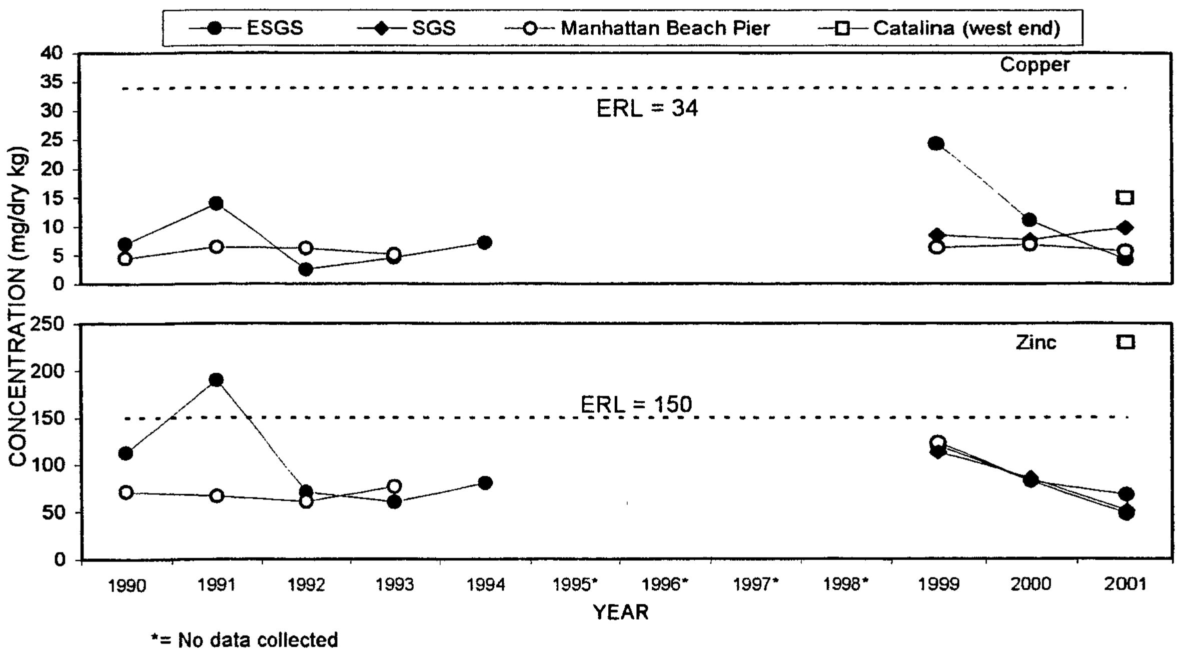


Figure 18. Comparison of copper and zinc concentrations in bay mussel tissue at a pier reference site and at the west end of Catalina, 1990 - 1994 and 1999 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Bay mussel tissue collected from the Scattergood discharge in 2001 also had detectable levels of copper and zinc. Mean copper concentration in 2001 was slightly higher than that noted at El Segundo, and was similar to the copper concentration detected in one replicate from Scattergood in 1999 (Figure 18) (MBC 1999). Mean zinc concentration in 2001 was considerably lower than zinc levels in 2000 and 1999 and was similar to concentrations noted at El Segundo in 2001. In 2001, copper and zinc concentrations in mussels collected from the two generating stations were similar to those from the Manhattan Pier reference site, but were well below levels found at the west end of Catalina Island reference site. In one replicate for copper from Scattergood, an anomalous concentration of 87 mg/dry kg was reported; as the laboratory was unable to determine the validity of the reported concentration and it appears to be a decimal point error, it has been reported herein as 8.7 mg/dry kg. With the possible exception of the one copper replicate from Scattergood, none of the samples in 2001 were above the ERL levels reported for sediments. As ERL levels were derived for sediment metal levels, they are used herein for comparison purposes only.

In 1988, California State Mussel Watch (CSMW) found levels of copper between 16 and 23 mg/dry kg in resident California mussels (*Mytilus californianus*) collected in Santa Monica Bay (SWRCB 1990). The same study also found levels of copper between 3 and 29 mg/wet kg in transplanted California mussels collected in nearby Marina Del Rey. Mussel tissue analyzed from Ormond Beach in 1991 had a copper concentration of 55 mg/wet kg (Ogden 1991). An overview of copper concentrations in whole bay mussels conducted by CSMW and NOAA in the Southern California Bight from 1980 to 1986 found copper tissue levels ranging from 4.0 to 120 mg/dry kg (NOAA 1991c). One conclusion was that copper appeared to be a contaminant in mussels principally near major recreational and industrial harbors, and secondarily near smaller harbors.

In the same CSMW and NOAA studies, zinc concentrations ranged from 80 to 560 mg/dry kg. In 2001, maximum replicate zinc concentration in the study area was 84 mg/dry kg (from a replicate at El Segundo Generating Station). Highest mean zinc concentration of three replicates in the study area occurred in 1991 at 190 mg/dry kg, but levels have since remained lower (Figure 18).

Mussel tissue metal levels within ranges of those found in other studies indicate that there is no major source of metals in the study area. Copper levels in mussel tissue from Scattergood were higher in 1999, 2000, and 2001 than in previous surveys, but levels were lower than levels noted at the Catalina Island reference site and were similar to concentrations recorded in 2000 in the El Segundo discharge samples.

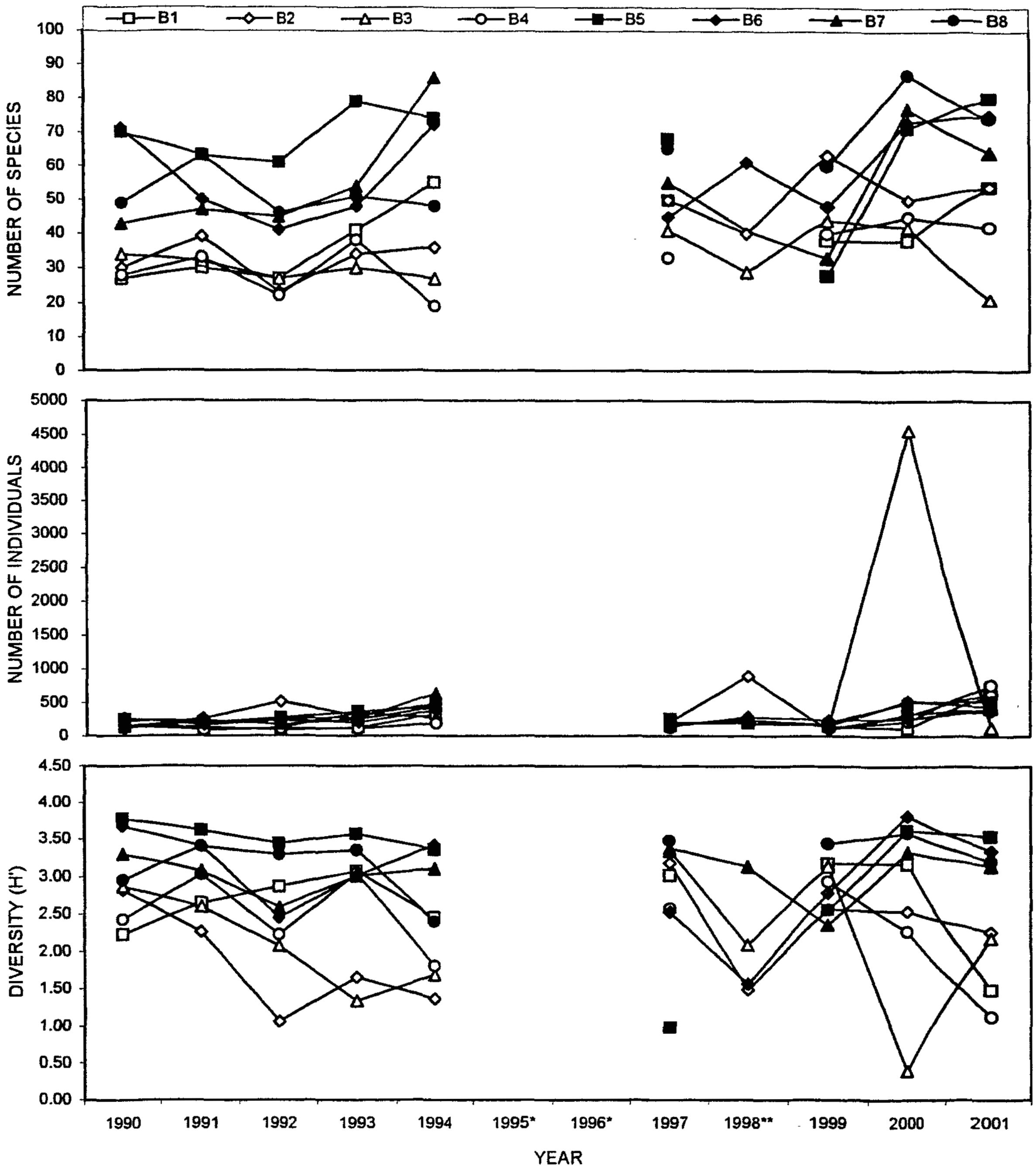
BIOLOGICAL MONITORING

Benthic Infauna

The benthic infauna offshore of the Scattergood and El Segundo Generating Stations was comprised primarily of annelid worms, small mollusks, and arthropods. More species occurred offshore than nearshore, with the highest number of species found furthest upcoast and offshore and the lowest number inshore and upcoast of the El Segundo Generating Station. Abundance was generally greater nearshore than offshore, with one notable exception: the number of individuals found immediately downcoast of the El Segundo Generating Station at Station B3 was about a quarter of the mean. This was probably related to the very low amount of silt and clay at that station; however, the highest abundance and species richness occurred at Station B5, an offshore station also with low amounts of silt and clay. At this station, sediments were composed of relict red sands which appear to have a completely different species composition as noted in the classification analysis which separated Station B5 into its own group because of this difference. Abundance did not necessarily correspond to species diversity as the highest and lowest abundances had the lowest species diversity indices. Species richness did correlate with species diversity.

The annelid worm *Apoprionospio pygmaea*, the most abundant species, was present in much greater abundance in the nearshore, whereas the amphipod *Diastylopsis tenuis* was more abundant by far at the two upcoast offshore stations. The other abundant species occurred primarily offshore.

Factors which contribute to infaunal community composition include habitat structure and food availability (Barnard 1963, Knox 1977). Habitat is partly determined by sediment characteristics, which in turn are controlled by disturbance, such as by water currents and wave action, which winnow away fine material. Sediment grain size influences the infauna through its



* = No data collected

** = Only 4 stations were sampled in 1998

Figure 19. Comparison of infaunal community parameters, 1990-2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

action, which winnow away fine material. Sediment grain size influences the infauna through its effect on stability and cohesiveness of the sediments, regulating the type of burrows these organisms build for protection and foraging (Posey 1985). Disturbance Hypothesis predicts that an area with a high amount of physical disturbance will support fewer species than one with a moderate amount of disturbance (Connell 1978). This is consistent with the findings in the study area, where the nearshore environment is subject to stronger, more constant wave action than is the area offshore. Coarser sediments, such as occurred nearshore in 2001, generally contain less organic material than do finer sediments. This is also important for the majority of the species occurring in the study area which are deposit or filter feeders, gathering particulate organic matter through various means. The ability to swim and quickly reburrow into the substrate following wave disturbance is also critical, limiting the range of species that can tolerate the nearshore environment (Oliver et al. 1980).

Results of the 2001 survey indicate the same core group of species common to the inshore waters of the Southern California Bight continued to dominate the infauna offshore of El Segundo and Scattergood Generating Stations. Although community composition shifts in response to oceanographic perturbations, the community dominants remained very similar to those of previous NPDES summer surveys from 1990 through 1994 and 1997 and 2000 (MBC 1990–1994, 1997-2000). Most consistent has been *Apoprionospio pygmaea*, which has been among the most abundant species in the study area, and, in fact, was the most abundant species in six of 13 surveys since 1978 (LCMR/IRC 1979, IRC 1981; OC 1987, 1989; MBC 1990-1994, 1997-2000). *Diastylopsis tenuis* and *Tellina modesta* have also been abundant in almost every survey, although neither has been the most abundant species; Pacific sand dollar has been abundant in some years (most abundant species in 1986) but not in others. Several less abundant species (e.g., *Mediomastus acutus*, *Rhepoxynius menziesi*, *Spiophanes bombyx*) have been present consistently, contributing to the character of the community. Occasionally, however, a species not usually found among the core group has been very abundant, enough so at times as to be the most abundant species for a survey. Gould beanclams, for example, were so abundant at one station as to be the most abundant species in 2000, but they have occurred only once before (in 1998), but even then they were not abundant. This species is known to experience increases and declines in its population. Gould beanclam occurs in dense aggregations on exposed sandy beaches and in the shallow subtidal habitat from Santa Cruz, California, to the southern end of the Baja California peninsula (Morris et al. 1980).

Like beanclams, Pacific sand dollars also recruit in large numbers (Chia 1969, Merrill and Hobson 1970). They typically occur in dense but patchy aggregations just seaward of the breaker line to depths of 12 m. Adults orient themselves semi-vertically in the sediment, only partially buried, and feed on suspended material swept by on currents. They move shoreward during calm conditions and into deeper water when conditions are rough. Winter storms are occasionally severe enough to disrupt the sand dollar beds, after which the site is recolonized by juveniles recruited from other locations. Although studies have indicated that sediment grain size does not influence site selection by larval sand dollars (Timko 1975, Smith 1981), results of surveys offshore of Mandalay Beach suggest that sand dollars avoid fine sediments (MBC 1998b). Sand dollars occurred both nearshore and offshore in 2001, but few individuals occurred nearshore. Sand dollars were fourth in numerical dominance in 2001. Studies have shown that disturbance of infaunal communities by larger animals such as rays, crabs, and moon snails results in lower diversities, primarily from loss of tube-building polychaetes, particularly those in the family Spionidae (Virnstein 1977, Wiltse 1980). Sand dollars also appear to affect the infaunal community by disturbing the sediment as they position themselves on edge but also stabilizing the sediment through reducing erosion and providing protection from predators for other organisms (Merrill and Hobson 1970, Smith 1981). Intertidal sand dollar beds have been found to contain fewer species than the surrounding habitat, while subtidal beds showed no difference in species richness but did contain a slightly different community composition. In 2000, the most abundant polychaetes, *Apoprionospio pygmaea* and *Polydora cirrosa*, both spionids, were less abundant where large sand dollars were present than they were elsewhere. Large sand dollars occurred in the study area in 2000, 1999, and 1992, all occurrences were at nearshore stations (MBC 1992, 1999, 2000). In 1992, they were found at Station B2 where sediments were coarsest for that year. Species richness and diversity were low and the most abundant species at that station was the polychaete *Hesionura coineaui difficilis*, a non-tubicolous, predatory species; another co-occurring, non-tubicolous polychaete, *Microphthalmus hystrix*, was also very abundant. Neither of these species is normally highly abundant in the shallow subtidal environment. In 1999, sand dollars were found in large numbers at Station B3. Although they were smaller in size, on average, than in either 1992 or 2000, species richness and diversity were greater than the average for the survey. However, tubicolous polychaetes, such as *A. pygmaea*, were sparse.

In addition to infaunal community dominants, statistical parameters can also provide some comparison among survey years. In 2001, abundance and species richness were greater than the long-term means, while species richness was the greatest of any survey year (LCMR/IRC 1979, IRC 1981; OC 1987, 1989; MBC 1990-1994, 1997-2000). (Average station abundances were compared instead of survey totals, because the number of stations sampled has differed among years; see Table 21 in MBC 1990). Abundance in 2001 (486 individuals per station) was greater than any other year except 2000, where the unusual occurrence of Gould's bean clam almost doubled the previously high number in 1978 (416 individuals per station), which was followed closely by 1998 (402 individuals). The most abundant species in the 2001 survey was *A. pygmaea* (187 individuals per station, 39% of the individuals collected). Since 1990, as in 2001, species richness and diversity have been greater offshore than nearshore (Figure 19). Generally, abundance has been greater offshore also, but in 1992, 1998, and 2000, unusually high abundances of particular species nearshore (usually at only one station) have countered this trend.

The pattern of species distribution, abundance, richness, and diversity for the 2001 infaunal analyses appears to be the result of natural processes. The Scattergood and El Segundo Generating Stations' discharges do not appear to have adversely impacted the nearshore or offshore infaunal communities.

Impingement

Fish

Specifics of the individual generating stations are presented below, followed by information on common species taken at the two locations.

El Segundo. Three heat treatments and six normal operation surveys at Units 1 & 2, and four heat treatments and ten normal operation surveys at Units 3 & 4 were conducted from 1 October 2000 to 30 September 2001. During these surveys, 45 species, with an estimated abundance of 4,734 individuals weighing an estimated 637.1 kg were taken.

Of the total abundance, approximately 93% was taken during heat treatments, while slightly less than 7% was estimated to be taken during normal operations. Approximately 60% of the individuals were taken during heat treatments at Units 3 & 4; 58% of the individuals taken during the nine heat treatments were taken in two separate heat treatments in late spring and summer, one at each unit pair.

Fish impingement biomass data from El Segundo Generating Station Units 1 & 2 and Units 3 & 4 are available from 1979 to 2001 (Table 15). Impingement biomass for 2001 at El Segundo Generating Station was about one-half of its long-term mean. Fish biomass at El Segundo Generating Station during the period from 1979 to 1983 averaged 3,333 kg per year, but since 1984, it has remained relatively low, averaging only 723 kg per year. Beginning in 1984, fish biomass at El Segundo Generating Station has been in a two-to-five year cycle, with biomass ranging from around 200 to 750 kg per year, then peaking above 1,000 kg, then dropping the following year. The more than three-fold decrease in impingement since 1983 was likely due to the decreased demand for power from El Segundo Generating Station following completion of Units 2 & 3 at San Onofre Nuclear Generating Station (SONGS) in 1983-1984. With increased capacity at SONGS, many of the southern California generating stations (including El Segundo Generating Station) have operated at much lower capacity and, more importantly for fish impingement, with fewer circulators running,

Table 15. Biomass (kg) of fish impinged during heat treatments, 1979 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Year	El Segundo 1 & 2	El Segundo 3 & 4	El Segundo Total	Scattergood
1979	1440.83	2248.46	3689.29	NA
1980	1353.74	2455.43	3809.17	NA
1981	1269.96	2612.56	3882.52	NA
1982	579.83	1980.86	2560.69	NA
1983	1357.23	1366.87	2724.10	NA
1984	239.93	515.91	755.84	NA
1985	351.89	465.38	817.27	NA
1986	99.65	1615.39	1715.04	3224.05
1987	215.97	328.76	544.73	1698.68
1988	210.71	55.15	265.86	1722.23
1989	274.86	9.12	283.98	1289.27
1990	109.33	614.87	724.20	1447.22
1991	380.48	20.26	400.74	2028.61
1992	48.53	358.85	407.38	931.23
1993	51.51	1022.71	1074.22	828.82
1994	0.53	760.45	760.98	5902.55
1995	70.41	667.99	738.40	1092.18
1996	15.11	209.48	224.59	4178.14
1997	13.54	1696.92	1710.46	1005.58
1998	0.00	406.84	406.84	1780.62
1999	41.00	338.66	379.66	2317.85
2000	37.99	1516.05	1557.04	5322.58
2001	368.31	268.81	637.12	2122.87
Mean	370.93	936.34	1307.40	2305.78

NA = Data not available

which resulted in decreased flows at the intake and a decline in impingement. In 2000 and 2001, the plant has operated at a higher percent capacity (with more flow) due to the increase in electricity demand. However, this alone is not the only factor influencing impingement losses, considering the 2.5-fold decrease in biomass and nearly 8-fold decrease in abundance between 2000 and 2001 (Appendix H-24); during 2000 the flow was 33.9% of total potential annual flow, while in 2001, it was 53.3%. During years of high abundance and biomass, the large change is usually a result of one or more pelagic schooling species occurring in one or two heat treatment surveys in high abundance. This is likely a result of chance encounters with the intake structure as these species pass nearby while foraging.

All species that occurred in impingement samples at El Segundo Generating Station were ranked for each of the last twelve years, and ranks were then averaged to determine the ten highest ranking species for the twelve-year period (Table 16). Only one of these species, queenfish, occurred among the ten highest rankings during every year over the last twelve years. The next four highly ranked species (jacksmelt, walleye surfperch, kelp bass, and salema) ranked among the top ten in 10 of the 12 years (Table 16). All of the ten species with highest average rankings were present in 2001; four of those species were present in impingement samples in every year since 1990, with five present in 11 of the 12 years.

Table 16. Ranking of the 10 most abundant fish species impinged during heat treatments at El Segundo Generating Station, 1990 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Species	El Segundo Impingement 1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average	FO
queenfish	1	3	2	1	5	2	2	2	2	-	1	1	2.0	11
jacksmelt	7	-	10	2	3	3	9	1	1	15	9	7	6.1	11
walleye surfperch	10	4	4	8	9	10	5	4	12	-	2	4	6.5	11
kelp bass	3	2	3	11	6	7	12	9	10	4	6	6	6.6	12
salema	21	20	5	4	4	4	8	3	3	3	3	3	6.8	12
Pacific sardine	-	-	33	3	1	1	4	6	4	2	7	21	8.2	10
blacksmith	2	1	1	8	8	6	14	12	-	13	22	8	8.6	11
white croaker	4	24	6	14	11	9	3	5	13	-	11	21	11.0	11
sargo	10	6	23	17	13	18	19	17	5	1	18	5	12.7	12
barred sandbass	5	7	7	19	7	11	15	15	27	9	24	14	13.3	12
Lowest ranking of year	26	31	33	40	38	40	28	39	31	22	46	39		
Number of species	31	39	44	50	42	43	36	45	38	29	50	45		

FO = frequency of occurrence

Scattergood. Five heat treatments were conducted at Scattergood Generating Station from 1 October 2000 to 30 September 2001. During these surveys, 47 species, with an estimated abundance of 39,256 individuals weighing an estimated 2,122.9 kg were taken.

Abundance at Scattergood Generating Station in 2001 was dominated by two species, Pacific sardine and queenfish, which together constituted almost 78% of the overall abundance. While the queenfish were distributed relatively evenly throughout the year, the Pacific sardine were all taken during a single heat treatment in late fall.

Heat treatment data are available from Scattergood Generating Station from 1986 to 2001 (Table 15). Impingement biomass for 2001 at Scattergood Generating Station was slightly lower than its long-term mean. At Scattergood Generating Station fish biomass was lowest in 1992 and 1993. The following year, 1994, had the highest biomass of the 16 years, with similar peaks noted in 1996 and 2000. The low values coincide with the largest El Niño event recorded; the three high biomass years appear to be related to the chance increase in impingement of densely schooling pelagic species such as jack mackerel (*Trachurus symmetricus*) and jacksmelt in 1994, queenfish in 1996, and queenfish, jacksmelt, topsmelt, and Pacific sardine in 2001. Scattergood Generating Station delivers electricity into a separate power grid than El Segundo Generating Station, and was not affected by SONGS going online. From 1990 to 1995, during these large fluctuations in biomass, Scattergood Generating Station had an annual flow during each year at about 59% of the maximum design yearly flow.

All species that occurred in impingement samples at Scattergood Generating Station were ranked for each of the last twelve years and ranks were then averaged to determine the most abundant species for the twelve-year period (Table 17). Only two of these species, queenfish and topsmelt, occurred among the ten highest rankings during every year over the last twelve years. Of the other eight species, three (salema, barred sand bass, and walleye surfperch) were among the top ten during at least ten of the twelve years (Table 17). All of the ten species with highest average rankings were present in 2001, and all of these species were present in impingement samples in every year since 1990.

Table 17. Ranking of the 10 most abundant fish species impinged during heat treatments at Scattergood Generating Station, 1990 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Scattergood Heat Treatments													
Species	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average	FO
queenfish	1	1	4	2	3	1	1	1	1	2	1	2	1.7	12
topsmelt	2	2	2	6	6	2	3	4	4	1	3	3	3.2	12
jacksmelt	12	15	5	11	2	5	4	8	6	3	2	4	6.4	12
salema	4	3	13	4	8	4	7	6	5	8	8	8	6.5	12
white croaker	16	13	15	13	5	3	6	7	2	10	5	5	8.3	12
barred sandbass	9	7	7	7	9	10	11	9	8	7	10	7	8.4	12
yellowfin croaker	14	19	9	18	12	9	5	3	7	5	6	11	9.8	12
walleye surfperch	7	9	3	8	13	6	8	5	9	42	9	6	10.4	12
sargo	3	6	6	3	10	21	20	14	11	13	11	9	10.6	12
Pacific sardine	33	48	19	1	4	11	2	16	3	4	4	1	12.2	12
Lowest ranking of year	53	56	48	42	51	47	50	46	47	42	55	40		
Number of species	53	64	54	53	60	52	58	53	56	53	62	47		

FO = frequency of occurrence

Of the most abundant species seen at the two generating stations in 2001, queenfish was the most abundant species at El Segundo, and second in abundance at Scattergood. It has been among the top five in abundance for the last eleven years, and is first in overall abundance since 1990 (Appendices H-24 and H-25). Queenfish are also among the most abundant fish caught in trawls in the nearshore Southern California Bight (MBC unpubl. trawl data). Queenfish is a schooling species abundant over sandy bottoms, and is most common at depths of 10 m (Allen 1982), which coincides with the depth of the intake structures. They form quiescent schools near the bottom in daytime, and disperse and feed in the water column at night (Love 1996), when they become susceptible to the intake currents.

Pacific sardine was the most abundant species in 2001 at Scattergood Generating Station, but had low abundance at El Segundo Generating Station. Pacific sardines have made a remarkable comeback after a disastrous decline in the fisheries in the early 1950s. Although impingement catches were sporadically monitored in the 1960s and broad-scale monitoring commenced in the 1970s, it was not until 1993 and 1994 that large numbers of sardines appeared in the impingement catches at El Segundo Generating Station and Scattergood Generating Station. They have continued to be visitors offshore the power plants as evidenced by their regular impingement at the power plants since 1990 (MBC 1990-1994, 1997-2000). In overall abundance since 1990, they are third at El Segundo Generating Station and fourth at Scattergood Generating Station (Appendices H-24 and H-25); in averaged rankings they are among the top ten species since 1990 (Tables 16 and 17). This parallels their recent rise in abundance in California waters as their population expands (Love 1991).

Northern anchovy, the second most abundant species in 2001 at El Segundo Generating Station, was represented by very few individuals at Scattergood Generating Station. It is a schooling species which maintains tight schools during the day, feeding in the water column. It is common in the Southern California Bight and is one of the species most frequently captured in sampling conducted by otter trawls and other trawled gear, indicating that it is rather evenly distributed over the mainland shelf offshore of southern California. Northern anchovy is also an important component of the ecosystem in southern California. Anchovy eggs and larvae are prey for vertebrate and invertebrate planktivores (Leet et al. 1992). Juveniles in nearshore areas support a variety of predators, including birds and some recreational and commercially-important species of fish. Adults offshore are utilized by marine fishes, mammals, and birds. A correlation between breeding success of the endangered California brown pelican and anchovy abundance has been observed. Northern anchovy are also important commercially, for use in conversion to meal, oil, and protein products, and as live bait, with an approximate biomass of 646,000 tons in the central subpopulation, offshore of the southern California area (Leet et al. 1992). Northern anchovy is among the top seven dominant species at both generating stations since 1990 (Appendices H-24 and H-25).

Topsmelt and jacksmelt were the third and fourth most abundant species in 2001 at Scattergood Generating Station; at El Segundo Generating Station, jacksmelt was seventh most abundant, with topsmelt represented by very few individuals. In overall abundance, they were both among the top five species at Scattergood Generating Station, and among the top eleven species at El Segundo Generating Station, for the last eleven years (Appendices H-24 and H-25). Both species occur in great abundance in the inshore waters of Santa Monica Bay and are especially attracted to the discharge structures because of foraging opportunities (Stephens 1977). These two species are active during the day and quiescent at night; they have been observed in the impingement catch in great numbers immediately following tunnel reversal operations occurring during heat treatments conducted during daylight (Curtis, MBC, pers. obs.). Both species are frequently caught in the sportfishery, and are important prey items for several marine birds, but are seldom targeted by the commercial fish industry (Leet et al. 1992). Jacksmelt form larger, denser schools than topsmelt, and range over much of the inshore area of California (Leet et al. 1992).

Kelp bass and barred sand bass, the sixth most abundant species at El Segundo, and seventh most abundant species at Scattergood, respectively, are important sportfish and are of concern to the resource agencies charged with their management. Barred sand bass are found on the bottom near the margins of reefs to which they are attracted as focal points for feeding, mating, and living area (Helvey and Smith 1985). Although barred sand bass populations are probably equally abundant near the two generating stations areas, there are more focal points near the El Segundo plant. The preponderance of focal points surrounding the area of the El Segundo

Generating Station, such as the beach erosion groins, the Chevron discharge structure, and the two intake and discharge structures at El Segundo Generating Station, concentrates the population to the more risky areas near the intakes, resulting in greater takes at that station.

Kelp bass, on the other hand, are attracted to high-relief patch reefs, not as a focal point, but because prey availability is maximized at high current areas, such as at reefs (or artificial reefs such as the cooling water intakes and discharges). This species actively swims in the water column, maintaining positive rheotaxis to the current flow, a behavior which exposes a greater portion of the kelp bass population than that of other species to the intake flow. The disparity in catches between the two generating stations with regards to kelp bass impingement is again probably explained by the higher density of focal points (intake and discharge structures) near the El Segundo Generating Station.

Variations in the population sizes, oceanographic conditions, and the random nature of the schooling and foraging behavior of these species encountering the intake appears to determine the abundance and biomass of the catch seen at the two generating stations. With the intake structures of the two generating stations within approximately one-half mile of each other, large catches of one species at one generating station, and the near absence of that species at the other generating station during the same year, highlight this natural variability. At El Segundo Generating Station, at least 26 species, and at Scattergood Generating Station at least 45 species, have occurred in impingement sampling during nine of the last twelve years (Appendices H-24 and H-25). This recurring core group of species demonstrates the stability of the community and suggests that the populations present offshore are not unduly stressed by the relatively minor loss due to entrainment.

The histograms for queenfish, kelp bass, and barred sand bass were relatively smooth curves, indicating that the intake is not selective but it is impinging a cross section of the population found in the nearshore waters at El Segundo Generating Station and Scattergood Generating Station.

Length-frequency histograms of the queenfish population indicated similar populations impinged at both Scattergood Generating Station and at El Segundo Generating Station and in similar abundances. Slightly more smaller fish were taken at El Segundo Generating Station, giving a bimodal distribution, versus a unimodal distribution at Scattergood Generating Station. Queenfish were most abundant in the impingement catch at 130 mm SL, corresponding to individuals slightly over one year old (DeMartini and Fountain 1981). The second mode at 70 mm SL at El Segundo Generating Station corresponds to young-of-the-year indicating the presence of a successful spawn. Bimodal distributions, with peaks at similar sizes, have been seen during most of the prior surveys (MBC 1990-1994, 1997-2000).

The kelp bass population ranged from one- to fifteen-year-old fish (70 to 500 mm SL) (Hulbrock 1974, Love 1996). At Scattergood Generating Station, most of the fish were young-of-the-year to age-two, while at El Segundo Generating Station, the kelp bass distribution indicated most of the population age-four to age-six fish (220 to 290 mm). The kelp bass population distribution has been almost identical for the last nine years (MBC 1990-1994, 1997-2000).

The barred sand bass population ranged from young-of-the-year to eleven-year-old fish (50 to 430 mm SL) (Hulbrock 1974, Love 1996). At both generating stations, most of the fish were age-three to age-five (200 to 260 mm). The barred sand bass population distribution has been almost identical for the last six years(MBC 1990-1994, 1997-1998).

Macroinvertebrates

Macroinvertebrate species, abundance, and distribution at the two generating stations are presented in the following text.

El Segundo. Macroinvertebrate abundance at El Segundo Generating Station in 2001 was about three times the 10 year average, with biomass about twice the 10-year average (Table 18). Abundance was similar to that seen in 1999, while biomass was less than was taken in both 1999 and 2000 (Table 18). Most of the abundance and biomass during 1999 to 2001 was from estimated normal operations losses. Three rock crab species, purple jellyfish, and tuberculate pear crabs were the most abundant species, similar to prior surveys (MBC 1990-1994, 1997-2000), and contributed greatly to the biomass, with California spiny lobster and California two-spot octopus (*Octopus bimaculoides*) also high in biomass.

Table 18. Number of species, number of individuals, and biomass (kg) of macroinvertebrates impinged at El Segundo and Scattergood Generating Stations, 1990 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

	ESGS*			SGS		
	Number			Number		
	Species	Individuals	Biomass	Species	Individuals	Biomass
1990	16	3572	1069.26	10	65	65.98
1991	12	615	30.29	9	153	67.14
1992	17	9994	123.50	25	7218	333.68
1993	21	2386	109.59	18	2253	98.55
1994	20	1290	66.05	20	4064	117.99
1997	20	7904	156.07	20	1305	60.36
1998	9	5573	236.43	18	3671	113.95
1999	14	36113	3038.42	18	1563	112.26
2000	22	9350	2141.31	24	2115	271.26
2001	14	32419	1569.21	21	2941	186.73
Mean	16.5	10921.6	854.0	18.3	2534.8	142.8

*1990-97 heat treatment data only; other years heat treatment and extrapolated normal operation combined data.

Scattergood. Macroinvertebrate abundance and biomass at Scattergood Generating Station in 2001 was slightly higher than the 10-year average (Table 18). Abundance was similar to that seen in 1998, while biomass was less than was taken in 2000 (Table 18). Three rock crab species, purple jellyfish, and tuberculate pear crabs were the most abundant species, similar to prior surveys (MBC 1990-1994, 1997-2000). Red-striped shrimp, two rock crab species, intertidal coastal shrimp and California spiny lobster accounted for most of the abundance, and the lobsters, California two-spot octopus, and three rock crab species comprised most of the biomass. These species are commonly among the most abundant species (MBC 1990-1994, 1997-2000)

Rock crabs are abundant at the generating station as larval stages are common in the plankton. These larval stages are entrained by the intake and many find the fouling community habitat growing on the intake and in the tunnels to there liking and settle therein. Typically, most of these larval stages do not survive to adulthood, but the availability of an unlimited food supply makes these intakes a superior habitat, until the next heat treatment. Jellyfish are common at certain times of the year in the inshore waters of the Southern California Bight; by chance, jellyfish encounter the intakes during passive drifting with ocean currents. Tuberculate pear crabs, and the shrimp and mollusk species seen, are common in the offshore sandy environment. Most of the individuals seen in the generating station are small in size, indicating that they are likely settling from the plankton in the intake conduits, and are removed in large numbers intermittently during plant operations. Some, such as California spiny lobster, are entrained irregularly as they forage near the intake structure.

Species diversity at both generating stations has remained similar since monitoring started, and abundance and biomass have fluctuated in a manner similar to that seen in the fish populations. Since the intake structure is providing habitat that would otherwise not be available, most of the individuals taken during impingement monitoring would most likely not have had adequate habitat to settle into, and therefore would have been lost to the offshore ecological environment. As

California spiny lobster are relatively large, they are removed from the intake water by the rakes and screens at the station. As most of these lobsters survive, they are physically removed by biologists and released back into the ocean unharmed. Therefore, the actual loss of the main commercial species, California spiny lobster, is minor compared to the amount removed by the commercial and sport industry, approximately 225,000 kg a year (Leet et al. 1992). Around 30% of the California spiny lobsters at each station were greater than the legal size limit (approximately 83 mm carapace length) (CDF&G 1997).

CONCLUSIONS

Water quality measurements in 2001 indicated that there was no detectable thermal elevation in the study area during either the winter or summer survey. Otherwise, only minor variations in temperature, DO, pH, and salinity were detected, all mostly due to temporal and spatial variations in upwelling of cold water and solar insolation to the surface waters. Water quality measurements indicated that the cooling water discharges from the El Segundo and Scattergood Generating Stations did not have an adverse effect on receiving waters in the study area.

Sediments in the study area were mostly sand, with a mean grain size in the fine sand category. Sediments were coarsest at offshore Station B5, upcoast of the Scattergood and El Segundo discharge structures, and finest at inshore Stations B1 and B2, also upcoast of the discharge structures. No spatial patterns were apparent that would suggest effects from the Scattergood or El Segundo Generating Stations. Natural causes, such as sediment deposition and transportation by nearshore currents, are likely responsible for interannual variation in sediment characteristics in the study area.

The distribution of metals in the sediments of the study area did not appear to be related to the generating station discharges in 2001. Highest concentrations of all metals were upcoast of the discharges and appear to be related to the amount of fine material in the sediments. Concentrations of all metals were within ranges typically found in sediments in the Southern California Bight and below levels determined to be potentially toxic to benthic organisms.

In 2001, mean copper and zinc concentrations from mussel tissue collected near the Scattergood Generating Station were similar to values recorded in 1999 and in 2000. At El Segundo, zinc and copper concentrations were similar to or lower than values recorded since 1990. All metal concentrations were within ranges found in other surveys in the Southern California Bight. Since 1990, chromium and nickel have not been detected in mussel tissues near the generating stations. These results indicate that the bioaccumulation of metals has not been appreciable near the El Segundo and Scattergood Generating Station discharges.

The benthic infaunal community in the study area in 2001 was similar to that of previous years and overall abundance and species richness were higher than the long term means and second highest recorded for the study area. Sediment characteristics appeared to influence the infaunal community, with greater abundance and species richness occurring offshore where sediments were finer and more poorly sorted. No pattern in species composition or abundance could be attributed to the Scattergood and El Segundo Generating Stations' discharges.

High diversity of the fish population entrained by the El Segundo and Scattergood Generating Stations' intakes suggest that a variety of niches are available in the area of the discharge and intake structures. High abundances are related to increased plant operations. Still, continued high diversity and abundance of core species, as evidenced by impingement data from the last eleven years, indicated that impingement at the El Segundo and Scattergood and Generating Stations is not unduly influencing the fish and macroinvertebrate communities in the nearshore.

The overall results of the 2001 NPDES monitoring program indicated that operation of the El Segundo and Scattergood Generating Stations had no detectable effects on the beneficial uses of the receiving waters.

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PERSONAL COMMUNICATIONS

Mofidi, F. 2001. Environmental Engineer. Department of Water and Power, City of Los Angeles. Scattergood Generating Station.

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APPENDIX A

Receiving water monitoring specifications

El Segundo Power, LLC
El Segundo Generating Station
Monitoring and Reporting Program No. CI- 4667

Order No. 00-084
CA0001147

B. Receiving Water Monitoring

The receiving water monitoring program shall consist of periodic biological surveys of the area surrounding the discharge, and shall include studies of those physical and chemical characteristics of the receiving waters which may be impacted by the discharge.

This program may be performed as a joint effort with the City of Los Angeles' Department of Water and Power in connection with the receiving water monitoring program for the Scattergood Generating Station.

Location of Sampling Stations (see Attached Figure 3):

1. Receiving water stations shall be located as follows:

   a. RWI - 7,875 feet upcoast of the Scattergood discharge terminus, at a depth of 20 feet.

   b. RW2 - 1,000 feet upcoast of the Scattergood discharge terminus, at a depth of 20.

   c. RW3 - 1,750 feet downcoast of the El Segundo discharge terminus, at a depth of 20 feet.

   d. RW4 - 9,900 feet downcoast of the El Segundo discharge terminus, at a depth of 20 feet.

   e. RW5 - directly offshore of Station RW1, at a depth of 40 feet.

   f. RW6 - directly offshore of Station RW2, at a depth of 40 feet.

   g. RW7 - directly offshore of station RW3, at a depth of 40 feet.

   h. RW8 - directly offshore of Station RW4, at a depth of 40 feet.

   i. RW9 - directly offshore of Station RW1, at a depth of 60 feet.

   j. RW10 - directly offshore of Station RW2, at a depth of 60 feet.

k. RW11 - directly offshore of Station RW3, at a depth of 60 feet.

l. RW12 - directly offshore of Station RW4, at a depth of 60 feet.

2. Benthic stations shall be located as follows:

   Stations B1 through B8 shall be located directly beneath Stations RW1 through RW8, respectively.

C. <u>Type and Frequency of Sampling</u>:

1. Temperature profiles shall be measured semi-annually (summer and winter) each year at Stations RW1 through RW12 from surface to bottom at a minimum of one meter intervals. Dissolved oxygen levels and pH shall be measured semi-annually at the surface, mid-depth and bottom at each station, at a minimum. All stations shall be sampled on both a flooding tide and an ebbing tide during each semi-annual survey.

2. Impingement sampling for fish and commercially important macroinvertebrates shall be conducted at least once every two months at intake Nos. 001 and 002. Impingement sampling shall coincide with heat treatments.

   Fish and macroinvertebrates shall be identified to the lowest possible taxon. For each intake point, data reported shall include numerical abundance of each fish and macroinvertebrate species, wet weight of each species (when combined weight of individuals in each species exceeds 0.2 kg), number of individuals in each 1-centimeter size class (based on standard length) for each species and total number of species are collected. When large numbers of given species are collected, length/weight data need only be recorded for 50 individuals and total number and total weight may be estimated based on aliquots samples. Total fish impinged per heat treatment or sampling event shall be reported and data shall be expressed per unit volume water entrained.

3. Native California mussels (Mytilus Californianus) shall be collected during the summer from the discharge conduit, as close to the point of discharge as possible, for bioaccumulation monitoring. The mussels shall be collected and analyzed as described in Appendix A of the "California State Mussel Watch Marine Water Quality Monitoring Program 1985-86" (Water Quality Monitoring Report No. 87-2WQ). Mussel tissue shall be analyzed for copper, chromium, nickel, and zinc at a minimum.

4. Benthic sampling shall be conducted annually during the summer at Stations B1 through B8.

   a. One liter sediment core samples shall be collected by divers at each of the benthic stations for biological examination and determination of biomass and diversity, and for sediment analyses. Four replicates shall be obtained at each station for benthic analyses, and each shall be analyzed separately. A fifth sample shall be taken at each station for sediment analyses and general description.

   b. Each benthic replicate sample shall be sieved through a 0.5 mm standard mesh screen. *All organisms recovered shall be enumerated and identified* to the lowest taxon possible. Infaunal organisms shall be reported as concentrations per liter for each replicate and each station. Total abundance, number of species and Shannon-Weiner diversity indices shall be calculated (using natural logs) for each replicate and each station.

      Biomass shall be determined as the wet weight in grams or milligrams retained on a 0.5 millimeter screen per unit volume (e.g., 1 liter) of sediment. Biomass shall be reported for each major taxonomic group (e.g., polychaetes, crustaceans, mollusks) for each replicate and each station.

   c. Sediment grain size analyses shall be performed on each sediment sample (sufficiently detailed to calculate percent weight in relation to phi size). Sub samples (upper two centimeters) shall be taken from each sediment sample and analyzed for copper, chromium, nickel and zinc.

5. The following general observations or measurements at the receiving water and benthic stations shall be reported.

   a. Tidal stage and time of monitoring.

   b. General water conditions.

   c. Extent of visible turbidity or color patches.

   d. Appearance of oil films or grease, or floatable material.

   e. Depth at each station for each sampling period.

   f. Presence or absence of red tide.

g. Presence of marine life.

h. Presence and activity of the California least tern and the California brown pelican.

6. During the discharge of calcareous material (excluding heat treatment discharge) to the receiving waters, the following observations or measurements shall be recorded and reported in the next monitoring report:

   a. Date and times of discharge(s).

   b. Estimate of volume and weight of discharge(s).

   c. Composition of discharge(s).

   d. General water conditions and weather conditions.

   e. Appearance and extent of any oil films or grease, floatable material or odors.

   f. Appearance and extent of visible turbidity or color patches.

   g. Presence of marine life.

   h. Presence and activity of the California least tern and the California brown pelican.

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El Segundo Power, LLC
El Segundo Generating Station
Monitoring and Reporting Program No. CI- 4667

Order No. 00-084
CA0001147

SUMMARY OF RECEIVING WATER MONITORING

Constituent	Units	Station No.	Type of Sample	Minimum Frequency of Analysis
Temperature	^0C	RW1-RW12	vertical profile	semi-annually (flood, ebb)
Dissolved oxygen	mg/L	RW1-RW12	vertical profile	semi-annually (flood, ebb)
pH	pH units	RW1-RW12	vertical profile	semi-annually (flood, ebb)
Fish and macro invertebrates	---	intakes No. 001 and 002	impingement	bimonthly
Mussels	---	Discharge	tissue	annually
Benthic infauna	---	B1-B8	grab	annually
Sediments	---	B1-B8	grab	annually

The receiving water monitoring report containing the results of semiannual and annual monitoring shall be received at the Regional Board on March 1 of each year following the calendar year of data collection.

V. STORMWATER MONITORING PROGRAM

The discharger shall implement the Monitoring and Reporting Requirements for individual dischargers contained in the general permit for Dischargers of Storm Water Associated with Industrial Activities (State Board Order No. 97-030-DWQ adopted on April 17, 1997. The monitoring reports shall be received at the Regional Board by July 1 of each year. Indicate in the report the Compliance File CI-4667.

Ordered By: Dennis A. Dickerson
Dennis A. Dickerson
Executive Officer

Date: June 29, 2000

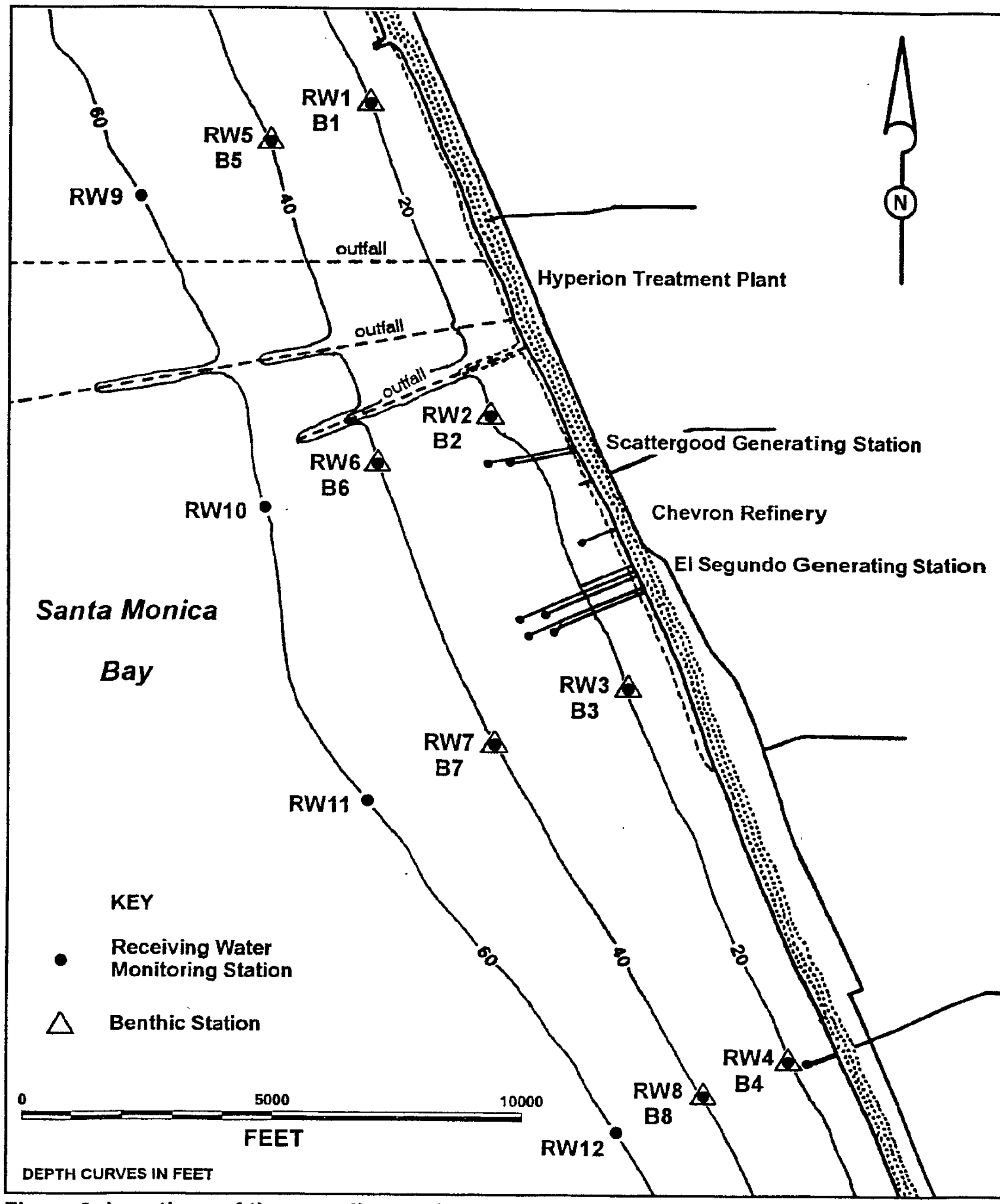


Figure 3. Locations of the sampling stations. El Segundo Generating Station.

Appendix A-2. Receiving water monitoring specifications. Scattergood Generating Station NPDES, 2001.

City of Los Angeles
Department of Water and Power
Scattergood Generating Station
Monitoring and Reporting Program No. CI- 1886

Order No 00-063
CA0000370

B. Receiving Water Monitoring

The receiving water monitoring program shall consist of periodic biological surveys of the area surrounding the discharge. and shall include studies of those physical and chemical characteristics of the receiving waters which may be impacted by the discharge.

This program may be performed as a joint effort with El Segundo Power. LLC. in connection with the receiving water monitoring program for the El Segundo Generating Station.

Location of Sampling Stations (see Attached Figure 3)

1. Receiving water stations shall be located as follows

a.	RWI -	7,875 feet upcoast of the Scattergood discharge terminus. at a depth of 20 feet.
b.	RW2 -	1,000 feet upcoast of the Scattergood discharge terminus. at a depth of 20.
c.	RW3 -	1,750 feet downcoast of the El Segundo discharge terminus, at a depth of 20 feet.
d.	RW4 -	9,900 feet downcoast of the El Segundo discharge terminus, at a depth of 20 feet.
e.	RW5 -	directly offshore of Station RW1, at a depth of 40 feet.
f.	RW6 -	directly offshore of Station RW2, at a depth of 40 feet.
g.	RW7 -	directly offshore of station RW3, at a depth of 40 feet.
h.	RW8 -	directly offshore of Station RW4, at a depth of 40 feet.
i.	RW9 -	directly offshore of Station RW1, at a depth of 60 feet.
j.	RW10 -	directly offshore of Station RW2, at a depth of 60 feet.
k.	RW11 -	directly offshore of Station RW3. at a depth of 60 feet.
l.	RW12 -	directly offshore of Station RW4. at a depth of 60 feet.

City of Los Angeles
Department of Water and Power
Scattergood Generating Station
Monitoring and Reporting Program No. CI- 1886

Order No 00-083
CA0000370

2. Benthic stations shall be located as follows:

   Stations B1 through B8 shall be located directly beneath Stations RW1 through RW8, respectively.

C. Type and Frequency of Sampling:

1. Temperature profiles shall be measured semi-annually (summer and winter) each year at Stations RW1 through RW12 from surface to bottom at a minimum of one meter intervals. Dissolved oxygen levels and pH shall be measured semi-annually at the surface, mid-depth and bottom at each station, at a minimum. All stations shall be sampled on both a flooding tide and an ebbing tide during each semi-annual survey.

2. Impingement sampling for fish and commercially important macroinvertebrates shall be conducted semi-annually at Intake No. 001. Impingement sampling shall coincide with heat treatments.

   Fish and macroinvertebrates shall be identified to the lowest possible taxon. For each intake point, data reported shall include numerical abundance of each fish and macroinvertebrate species, wet weight of each species (when combined weight of individuals in each species exceeds 0.2 kg), number of individuals in each 1 centimeter size class (based on standard length) for each species and total number of species are collected. When large numbers of given species are collected, length/weight data need only be recorded for 50 individuals and total number and total weight may be estimated based on aliquots samples.

3. Native California mussels (Mytilus Calfornianus) shall be collected during the summer from the discharge conduit, as close to the point of discharge as possible, for bioaccumulation monitoring. The mussels shall be collected and analyzed as described in Appendix A of the "California State Mussel Watch Marine Water Quality Monitoring Program 1985-86" (Water Quality Monitoring Report No. 87-2WQ). Mussel tissue shall be analyzed for copper, chromium, nickel, and zinc at a minimum.

4. Benthic sampling shall be conducted annually during the summer at Stations B1 through B8.

   a. One liter sediment core samples shall be collected by divers at each of the benthic stations for biological examination and determination of biomass and diversity, and for sediment analyses. Four replicates shall be obtained at each station for benthic analyses, and each shall be analyzed separately. A fifth sample shall be taken at each station for sediment analyses and general description.

b. Each benthic replicate sample shall be sieved through a 0.5 mm standard mesh screen. All organisms recovered shall be enumerated and identified to the lowest taxon possible. Infaunal organisms shall be reported as concentrations per liter for each replicate and each station. Total abundance, number of species and Shannon-Weiner diversity indices shall be calculated (using natural logs) for each replicate and each station.

   Biomass shall be determined as the wet weight in grams or milligrams retained on a 0.5 millimeter screen per unit volume (e.g., 1 liter) of sediment. Biomass shall be reported for each major taxonomic group (e.g., polychaetes, crustaceans, mollusks) for each replicate and each station

c. Sediment grain size analyses shall be performed on each sediment sample (sufficiently detailed to calculate percent weight in relation to phi size). Sub samples (upper two centimeters) shall be taken from each sediment sample and analyzed for copper, chromium, nickel and zinc.

5. The following general observations or measurements at the receiving water and benthic stations shall be reported.

   a. Tidal stage and time of monitoring.
   b. General water conditions.
   c. Extent of visible turbidity or color patches.
   d. Appearance of oil films or grease, or floatable material.
   e. Depth at each station for each sampling period.
   f. Presence or absence of red tide.
   g. Presence of marine life.
   h. Presence and activity of the California least tern and the California brown pelican.

6. During discharge of calcareous material (not including heat treatments) to the receiving waters, the following observations or measurements shall be recorded and reported in the next monitoring report:

   a. Date and times of discharge(s).
   b. Estimate of volume and weight of discharge(s).
   c. Composition of discharge(s).
   d. General water conditions and weather conditions.
   e. Appearance and extent of any oil films or grease, floatable material or odors.
   f. Appearance and extent of visible turbidity or color patches.
   g. Presence of marine life.
   h. Presence and activity of the California least tern and the California brown pelican

City of Los Angeles
Department of Water and Power
Scattergood Generating Station
Monitoring and Reporting Program No. CI- 1886

Order No 00-083
CA0000370

SUMMARY OF RECEIVING WATER MONITORING

Constituent	Units	Station No.	Type of Sample	Minimum Frequency of Analysis
Temperature	°C	RW1-RW12	vertical profile	semi-annually (flood, ebb)
Dissolved oxygen	mg/L	RW1-RW12	vertical profile	semi-annually (flood, ebb)
pH	pH units	RW1-RW12	vertical profile	semi-annually (flood, ebb)
Fish and macro invertebrates	---	Intakes No. 001	impingement	bi-monthly
Mussels	---	Discharge	tissue	annually
Benthic infauna	---	B1-B8	grab	annually
Sediments	---	B1-B8	grab	annually

The receiving water monitoring report containing the results of semiannual and annual monitoring shall be received at the Regional Board on March 1 of each year following the calendar year of data collection.

V. STORM WATER MONITORING AND REPORTING

The Discharger shall continue to maintain and implement Storm Water Pollution Prevention Plan as required in the Permit Provisions (Order No. 00-083).

Ordered By:
Dennis A. Dickerson
Executive Officer

Date: June 29, 2000

City of Los Angeles
Department of Water and Power
Scattergood Generating Station
Monitoring and Reporting Program No. CI-1886

Order No. 00-083
CA0000370

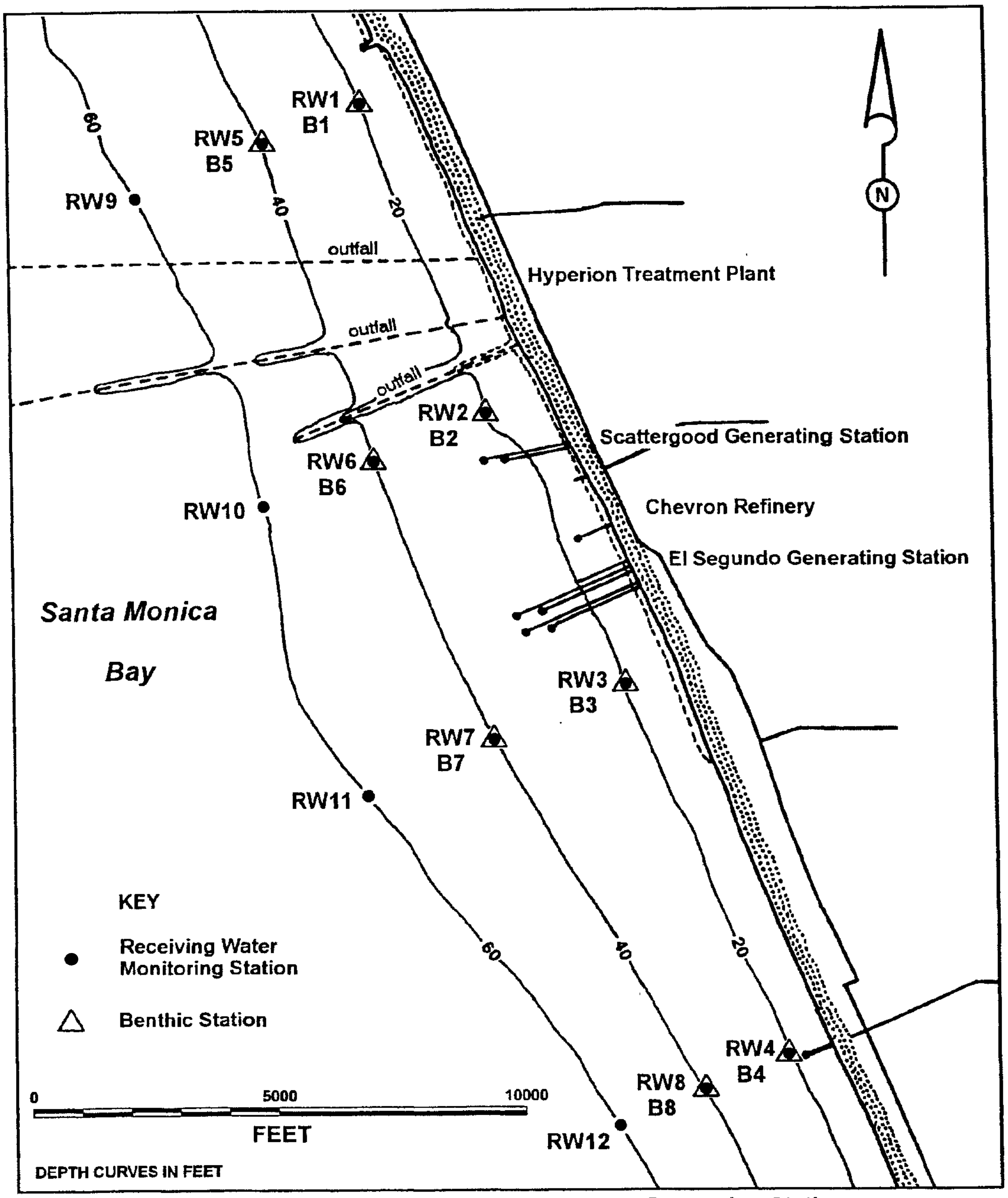


Figure 3. Locations of the sampling stations. Scattergood Generating Station.

APPENDIX B

Grain size techniques

Appendix B. Grain size techniques.

Sediment Grain Size Analysis

Analysis of sediment samples for size distribution characteristics are performed using two techniques. Sediments in the gravel size range (> 2.0 mm in diameter) are analyzed using a series of standard sieves having screen openings of 0.5 phi increments (diameter in phi units = $-\log_2$ diameter in mm, or = -ln diameter in mm ÷ ln 2). The sand-silt-clay fraction of sediments [-1 phi through 4 phi (2.0 mm through 0.0625 mm) for sand], [4 phi through 8 phi (0.0625 mm through 0.004 mm) for silt, 8 phi and greater for clay (0.0039 mm and smaller)] is analyzed by laser light diffraction. The sample is suspended in a suspension column and continuously circulated through the laser beam. The laser beam passes through the sample where the suspended particles scatter incident light. Fourier optics collect diffracted light and focus it on to three sets of detectors. A composite, time-averaged diffraction pattern is measured by 126 detectors. Sizes are computed and summed into normal distribution classifications.

Laboratory data from the two methods are mathematically combined and entered into a computer program which calculates and prints size-distribution characteristics and plots both interval and cumulative frequency distribution curves.

Analysis of the plotted cumulative size frequency curves is performed as described by Inman (1952). The median, 5th, 16th, 84th, and 95th percentiles (converted to phi notation) of the sediment distribution curve is used to calculate mean grain size diameter, sorting coefficient, and measures of skewness and kurtosis. Where sediment distribution coincides with a normal distribution curve, the 16th and 84th percentiles represent diameters one standard deviation on either side of the mean. The following formulas are used in the calculations:

1. Mean Diameter (M_ϕ) is the average particle size in the central 68% of the distribution.

$$M_\phi = \left(\phi_{16} + \phi_{50} + \phi_{84}\right) \ / \ 3$$

2. Sorting (σ_ϕ) measures the uniformity (or non-uniformity) of particle quantities in each size category of the sediment distribution. A σ_ϕ value under 0.35ϕ indicates that particles are very well sorted (i.e. sediments are primarily composed of a narrow range of size classes, or a single size class), while a value of over 4.0ϕ indicates that the sediments are extremely poorly sorted, or evenly distributed among size classes.

$$\sigma_\phi = \frac{\phi_{84} - \phi_{16}}{4} + \frac{\phi_{95} - \phi_5}{6.6}$$

3. Skewness (α_ϕ) is a measure of the direction and extent of departure of the mean from the median (in a normal or symmetrical curve they coincide). In symmetrical curves, α_ϕ=0.00 with limits of -1.00 and +1.00. Negative values indicate the particle distribution is skewed toward larger particle diameters, while positive values indicate the distribution is skewed toward smaller particle diameters.

$$\alpha_\phi = \frac{\phi_{16} + \phi_{84} - 2\phi_{50}}{2\left(\phi_{84} - \phi_{16}\right)} + \frac{\phi_5 + \phi_{95} - 2\phi_{50}}{2\left(\phi_{95} - \phi_5\right)}$$

4. Kurtosis (β_ϕ) is a measure of how far the sediment distribution curve departs from a normal Gaussian shape at its peak. Curves with greater than normal amounts of sediment at their modes will be sharp or leptokurtic ($\beta_\phi > 1$). Those with fatter tails and lower peaks than expected are termed platykurtic ($\beta_\phi < 1$). β_ϕ = 1.00 for a normal curve. Curve category interpretations are based on Folk (1974).

$$\beta_\phi = \frac{\phi_{95} - \phi_5}{2.44\left(\phi_{75} - \phi_{25}\right)}$$

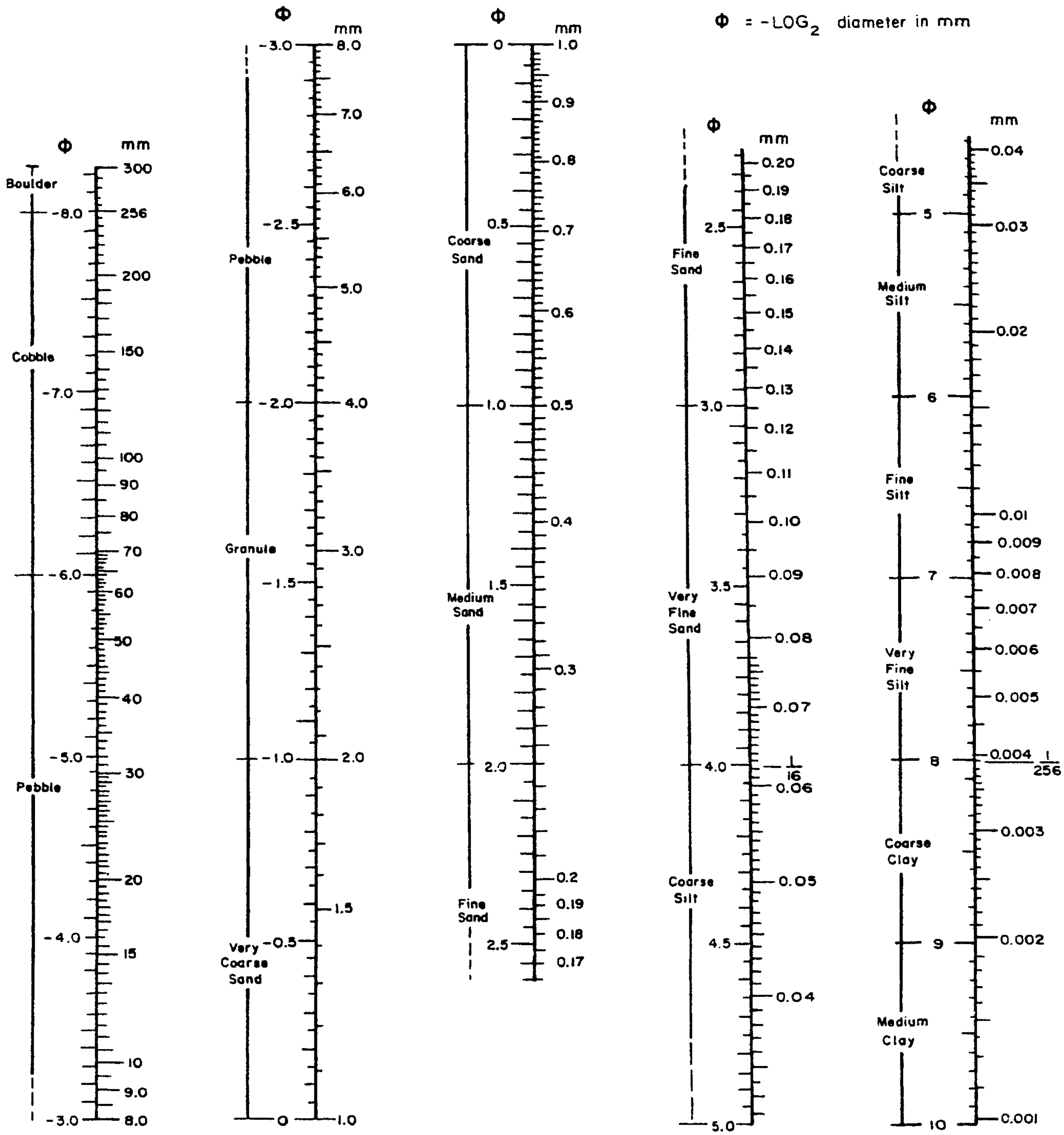
LITERATURE CITED

Folk, R. L. 1974. Petrology of sedimentary rocks. Hemphill Publishing Co., Austin, TX. 182 p.

Inman, D. L. 1952. Measures for describing the size distribution of sediments. J. Sed. Pet. 22:125-145.

Appendix B. (Cont.).

Phi - Millimeter Conversion Figure



Measurement sorting values for a large number of sediments has suggested the following verbal classification scale for sorting:

σ_I under	.35 ϕ,	very well sorted	1.0-2.0 ϕ,	poorly sorted
	.35-.50 ϕ,	well sorted	2.0-4.0 ϕ,	very poorly sorted
	.50-.71 ϕ,	moderately well sorted	over 4.0 ϕ,	extremely poorly sorted
	.71-1.0 ϕ	moderately sorted		

APPENDIX C

Water quality parameters at each receiving water monitoring station

Appendix C-1. Water quality parameters at each receiving water monitoring station during flood and ebb tides. El Segundo and Scattergood Generating Stations NPDES, winter 2001.

		Temp. (°C)		Oxygen (mg/l)		pH		Salinity (ppt)	
	Depth (m)	FLOOD	EBB	FLOOD	EBB	FLOOD	EBB	FLOOD	EBB
RW1	0	15.49	16.59	8.45	8.55	8.10	8.15	33.18	33.13
	1	15.49	16.51	8.36	8.55	8.10	8.17	33.19	33.14
	2	15.46	16.37	8.37	8.55	8.11	8.18	33.19	33.15
	3	15.45	16.17	8.43	8.66	8.11	8.18	33.19	33.13
	4	15.46	15.75	8.48	9.06	8.11	8.16	33.19	33.24
	5	15.47	15.02	8.42	9.40	8.12	8.10	33.19	33.22
	6	15.43	14.09	8.46	8.72	8.12	7.98	33.17	33.31
	7	15.24		8.56		8.08		33.21	
RW2	0	16.06	16.48	8.37	8.33	8.11	8.11	33.21	33.21
	1	16.03	16.46	8.38	8.35	8.11	8.11	33.21	33.21
	2	15.96	16.23	8.40	8.38	8.11	8.13	33.21	33.21
	3	15.92	16.07	8.41	8.50	8.11	8.13	33.22	33.24
	4	15.83	15.66	8.41	8.75	8.12	8.11	33.21	33.21
	5	15.74	15.39	8.44	8.84	8.11	8.11	33.22	33.24
	6	15.66	15.35	8.43	8.65	8.10	8.08	33.22	33.28
RW3	0	16.68	16.70	7.92	7.99	8.05	8.07	33.25	33.24
	1	16.49	16.65	7.99	7.97	8.06	8.07	33.21	33.24
	2	16.01	15.89	8.11	8.20	8.06	8.06	33.24	33.22
	3	15.92	13.70	8.09	8.73	8.06	7.97	33.25	33.49
	4	15.88	13.49	8.04	8.20	8.07	7.93	33.24	33.43
	5	15.78	13.44	8.06	7.31	8.07	7.93	33.21	33.41
	6	15.56	13.51	8.12	6.85	8.07	7.93	33.22	33.41
RW4	0	15.93	16.55	8.23	7.77	8.08	8.06	33.24	33.24
	1	15.93	16.56	8.16	7.51	8.08	8.07	33.24	33.24
	2	15.89	16.40	8.18	7.82	8.08	8.06	33.24	33.21
	3	15.81	15.49	8.26	8.26	8.08	8.05	33.23	33.23
	4	15.62	13.69	8.30	8.78	8.08	7.98	33.25	33.39
	5	15.49	13.44	8.28	8.53	8.06	7.93	33.26	33.43
	6	15.40	13.42	8.29	7.96	8.06	7.93	33.26	33.42
	7	15.39	14.06	8.27	7.01	8.06	7.93	33.26	33.40
RW5	0	15.90	15.93	8.60	9.15	8.13	8.18	33.19	33.19
	1	15.83	15.91	8.55	9.08	8.13	8.19	33.19	33.18
	2	15.64	15.82	8.66	9.20	8.13	8.19	33.18	33.17
	3	15.58	15.55	8.67	9.31	8.13	8.19	33.19	33.19
	4	15.50	15.43	8.70	9.53	8.14	8.16	33.18	33.17
	5	15.46	15.25	8.71	9.63	8.14	8.13	33.19	33.19
	6	15.42	14.74	8.78	9.53	8.13	8.09	33.18	33.26
	7	15.33	14.30	8.81	9.05	8.12	8.04	33.19	33.30
	8	15.24	13.52	8.73	8.68	8.10	7.97	33.19	33.41
	9	15.11	13.45	8.55	7.88	8.09	7.91	33.21	33.38
	10	14.97	12.77	8.45	7.02	8.07	7.88	33.21	33.44
	11	14.75	12.76	8.25	6.87	8.06	7.87	33.22	33.44
	12	14.18	12.76	8.06	6.29	8.00	7.87	33.23	33.44
	13	14.01	12.76	7.60	6.07	7.96	7.87	33.26	33.43
RW6	0	15.45	15.98	8.17	9.08	8.12	8.15	33.14	33.21
	1	15.34	15.98	8.22	9.05	8.12	8.15	33.20	33.20
	2	15.21	15.97	8.49	9.13	8.10	8.15	33.23	33.20
	3	15.19	15.91	8.51	9.18	8.10	8.15	33.23	33.19
	4	15.13	15.47	8.44	9.30	8.10	8.15	33.24	33.20
	5	15.11	14.84	8.39	9.47	8.08	8.09	33.24	33.24
	6	15.10	14.12	8.24	9.46	8.09	8.04	33.24	33.31
	7	15.08	13.68	8.17	8.81	8.08	7.97	33.24	33.34
	8	15.08	13.36	8.13	7.94	8.08	7.93	33.25	33.39
	9	15.07	13.26	8.11	7.16	8.08	7.90	33.25	33.39
	10	15.05	13.12	8.06	6.64	8.06	7.89	33.25	33.40
	11	15.03	12.85	7.99	6.51	8.05	7.87	33.24	33.41
	12	14.44	12.72	8.05	6.40	8.01	7.85	33.24	33.44
	13	14.18	12.71	7.82	6.01	7.95	7.84	33.33	33.44

Appendix C-1. (Cont.).

	Depth (m)	Temp. (°C) FLOOD	Temp. (°C) EBB	Oxygen (mg/l) FLOOD	Oxygen (mg/l) EBB	pH FLOOD	pH EBB	Salinity (ppt) FLOOD	Salinity (ppt) EBB
RW7	0	15.65	17.29	8.29	8.48	8.10	8.07	33.25	33.21
	1	15.64	17.10	8.16	8.35	8.10	8.08	33.25	33.22
	2	15.32	15.96	8.44	8.64	8.09	8.11	33.25	33.24
	3	15.10	15.35	8.55	8.63	8.07	8.10	33.23	33.25
	4	14.96	14.37	8.57	8.96	8.06	8.04	33.27	33.26
	5	14.92	13.83	8.31	8.93	8.06	7.97	33.28	33.37
	6	14.78	13.01	8.16	8.11	8.05	7.91	33.27	33.44
	7	14.50	12.50	8.22	7.36	8.02	7.87	33.31	33.49
	8	14.37	12.38	8.15	6.82	8.01	7.83	33.31	33.49
	9	14.20	12.23	7.84	6.37	8.00	7.82	33.32	33.50
	10	13.96	12.13	7.64	6.02	7.98	7.81	33.34	33.51
	11	13.77	12.09	7.45	5.72	7.97	7.80	33.35	33.59
	12	13.50	11.79	7.40	5.51	7.95	7.77	33.35	33.57
	13	13.32	11.80	7.28	5.25	7.90	7.78	33.44	33.56
RW8	0	15.74	17.10	7.96	8.11	8.06	8.09	33.26	33.22
	1	15.74	16.96	7.77	8.07	8.06	8.09	33.25	33.17
	2	15.57	15.69	8.04	8.53	8.06	8.09	33.28	33.20
	3	15.28	15.05	8.09	8.74	8.06	8.07	33.29	33.28
	4	15.08	14.59	8.25	8.80	8.06	8.05	33.34	33.30
	5	14.92	13.59	8.37	8.93	8.04	8.00	33.31	33.35
	6	14.85	12.89	8.31	8.79	8.04	7.90	33.32	33.46
	7	14.80	12.83	8.19	8.06	8.03	7.87	33.30	33.46
	8	14.67	12.73	8.11	7.07	8.02	7.87	33.31	33.46
	9	14.25	12.40	8.04	6.47	8.00	7.85	33.32	33.45
	10	13.62	11.82	7.99	6.50	7.96	7.80	33.41	33.57
	11	13.42	11.76	7.44	6.41	7.94	7.77	33.39	33.57
	12	13.24	11.78	7.23	5.82	7.91	7.76	33.41	33.59
	13	13.28	11.93	6.94	5.04	7.92	7.77	33.40	33.62
RW9	0	15.60	16.02	8.56	8.96	8.12	8.15	33.14	33.20
	1	15.34	16.01	8.65	8.93	8.12	8.15	33.17	33.20
	2	14.96	15.87	8.81	9.04	8.11	8.15	33.23	33.19
	3	14.69	15.17	8.77	9.22	8.08	8.12	33.25	33.22
	4	14.60	14.80	8.57	9.32	8.06	8.08	33.25	33.23
	5	14.53	14.53	8.28	9.05	8.04	8.06	33.24	33.27
	6	14.41	14.08	8.02	8.66	8.02	8.01	33.26	33.30
	7	14.28	13.53	7.80	8.31	8.02	7.96	33.28	33.35
	8	14.15	13.01	7.69	7.91	8.00	7.90	33.29	33.40
	9	14.08	12.70	7.61	7.38	8.00	7.87	33.29	33.44
	10	13.86	12.43	7.56	6.57	7.99	7.83	33.30	33.48
	11	13.55	12.34	7.53	6.15	7.96	7.81	33.34	33.48
	12	13.43	12.35	7.28	5.87	7.93	7.81	33.36	33.48
	13	13.41	12.33	6.94	5.59	7.93	7.81	33.36	33.47
	14	13.27	12.31	6.77	5.50	7.92	7.81	33.37	33.48
	15	13.21	12.29	6.70	5.48	7.91	7.81	33.38	33.48
	16	13.14	12.28	6.54	5.48	7.91	7.81	33.38	33.48
	17	12.92	12.27	6.47	5.49	7.88	7.81	33.43	33.48
	18	13.00	12.27	6.23	5.45	7.87	7.81	33.38	33.48
	19	12.75	12.28	6.18	5.43	7.86	7.81	33.53	33.47

Appendix C-1. (Cont.).

	Depth (m)	Temp. (°C) FLOOD	Temp. (°C) EBB	Oxygen (mg/l) FLOOD	Oxygen (mg/l) EBB	pH FLOOD	pH EBB	Salinity (ppt) FLOOD	Salinity (ppt) EBB
RW10	0	15.58	15.82	8.54	8.61	8.12	8.11	33.22	33.23
	1	15.58	15.76	8.50	8.62	8.12	8.11	33.24	33.23
	2	15.36	15.67	8.61	8.66	8.12	8.12	33.22	33.22
	3	14.62	15.42	8.81	8.74	8.08	8.13	33.27	33.21
	4	14.36	14.73	8.82	8.95	8.04	8.12	33.30	33.27
	5	14.32	14.40	8.48	9.05	8.02	8.04	33.31	33.31
	6	14.31	13.88	7.98	9.12	8.02	7.99	33.31	33.35
	7	14.30	13.36	7.81	8.61	8.02	7.94	33.31	33.39
	8	14.27	13.12	7.75	7.69	8.01	7.91	33.31	33.41
	9	14.25	12.66	7.71	7.07	8.00	7.89	33.31	33.44
	10	14.27	12.35	7.65	6.78	8.01	7.86	33.31	33.49
	11	14.21	12.25	7.66	6.54	8.01	7.83	33.31	33.49
	12	14.20	12.09	7.68	6.28	8.00	7.82	33.31	33.51
	13	14.19	11.98	7.61	5.99	8.00	7.81	33.31	33.52
	14	14.18	11.89	7.51	5.79	8.00	7.80	33.31	33.52
	15	14.12	11.75	7.49	5.63	8.00	7.79	33.33	33.54
	16	13.78	11.66	7.53	5.48	7.96	7.78	33.39	33.55
	17	12.76	11.61	7.57	5.37	7.88	7.76	33.46	33.56
	18	12.69	11.56	6.97	5.20	7.85	7.76	33.45	33.57
	19	12.74	11.59	5.92	4.92	7.84	7.76	33.47	33.56
RW11	0	15.58	16.07	8.45	8.29	8.08	8.11	33.26	33.23
	1	15.55	16.08	8.31	8.28	8.08	8.12	33.27	33.23
	2	15.37	16.07	8.34	8.30	8.08	8.11	33.30	33.23
	3	14.88	16.05	8.69	8.38	8.06	8.11	33.35	33.23
	4	14.50	16.04	8.54	8.53	8.03	8.11	33.37	33.23
	5	13.87	16.03	8.57	8.64	7.99	8.12	33.37	33.23
	6	13.50	15.81	8.38	8.72	7.95	8.11	33.40	33.18
	7	13.34	15.23	7.63	8.92	7.93	8.08	33.41	33.34
	8	13.06	14.19	7.32	9.13	7.91	8.04	33.45	33.29
	9	12.72	13.07	7.07	9.16	7.88	7.95	33.47	33.42
	10	12.71	12.90	6.68	8.54	7.87	7.90	33.47	33.46
	11	12.58	12.64	6.46	7.55	7.86	7.88	33.45	33.44
	12	12.57	11.92	6.27	6.84	7.85	7.82	33.46	33.53
	13	12.47	11.75	6.15	6.54	7.84	7.79	33.46	33.56
	14	12.45	11.63	6.02	5.89	7.84	7.76	33.47	33.57
	15	12.42	11.57	5.93	5.26	7.84	7.75	33.46	33.58
	16	12.38	11.56	5.90	4.99	7.84	7.75	33.46	33.58
	17	12.24	11.56	5.86	4.93	7.83	7.76	33.47	33.57
	18	11.99	11.56	5.83	4.94	7.81	7.75	33.51	33.57
	19	11.92	11.58	5.47	4.91	7.79	7.76	33.53	33.58
RW12	0	15.57	16.49	8.41	8.47	8.08	8.11	33.27	33.24
	1	15.54	16.46	8.37	8.51	8.07	8.11	33.28	33.22
	2	15.46	16.22	8.44	8.61	8.07	8.10	33.28	33.25
	3	14.93	16.09	8.57	8.60	8.05	8.11	33.30	33.22
	4	14.64	15.52	8.50	8.74	8.03	8.10	33.31	33.26
	5	14.41	15.26	8.20	8.71	8.01	8.09	33.31	33.27
	6	14.15	14.87	7.99	8.69	7.99	8.08	33.35	33.28
	7	13.94	14.22	7.78	8.74	7.98	8.03	33.36	33.31
	8	13.51	13.11	7.72	8.49	7.96	7.95	33.37	33.50
	9	13.24	12.80	7.52	7.67	7.92	7.90	33.42	33.45
	10	13.09	12.68	7.16	7.03	7.91	7.88	33.41	33.42
	11	12.94	12.38	6.90	6.62	7.90	7.86	33.44	33.52
	12	12.80	11.94	6.78	6.42	7.89	7.82	33.43	33.48
	13	12.74	11.61	6.58	6.08	7.87	7.77	33.43	33.56
	14	12.56	11.60	6.35	5.48	7.86	7.75	33.42	33.57
	15	12.12	11.60	6.14	4.98	7.81	7.75	33.51	33.56
	16	12.00	11.59	5.69	4.88	7.79	7.75	33.48	33.56
	17	11.75	11.59	5.43	4.88	7.77	7.75	33.56	33.56
	18	11.73	11.59	5.18	4.88	7.76	7.76	33.55	33.56
	19	11.76	11.60	5.02	4.83	7.76	7.76	33.55	33.56

Appendix C-2. Water quality parameters at each receiving water monitoring station during flood and ebb tides. El Segundo and Scattergood Generating Stations NPDES, summer 2001.

		Temp. (°C)		Oxygen (mg/l)		pH		Salinity (ppt)	
	Depth (m)	FLOOD	EBB	FLOOD	EBB	FLOOD	EBB	FLOOD	EBB
RW1	0	20.19	20.43	7.57	7.77	7.98	7.98	33.20	33.38
	1	20.25	20.30	7.51	7.79	7.98	7.99	33.29	33.44
	2	19.84	19.71	7.62	7.92	7.99	7.99	33.49	33.59
	3	19.09	18.19	7.89	8.25	7.97	7.96	33.57	33.56
	4	18.36	16.89	7.89	8.14	7.95	7.91	33.55	33.57
	5	18.02	16.32	7.74	7.82	7.92	7.90	33.54	33.51
	6	17.79	16.14	7.51	7.71	7.91	7.88	33.53	33.50
	7	17.43	16.11	7.49	7.54	7.89	7.88	33.56	33.49
RW2	0	20.20	19.89	7.69	7.60	7.99	7.96	33.53	33.51
	1	20.14	19.80	7.72	7.61	7.99	7.96	33.53	33.47
	2	19.66	18.80	7.87	7.86	7.98	7.94	33.52	33.41
	3	19.25	17.67	7.89	7.77	7.96	7.91	33.54	33.65
	4	18.87	17.29	7.72	7.42	7.95	7.90	33.53	33.53
	5	18.79	17.10	7.63	7.30	7.95	7.89	33.53	33.50
	6	18.34	17.05	7.64	7.30	7.93	7.89	33.51	33.49
	7	17.49	16.86	7.67	7.33	7.91	7.88	33.50	33.50
	8	17.15	16.94	7.41	7.28	7.90	7.88	33.53	33.43
RW3	0	20.42	20.34	7.82	7.60	7.99	7.98	33.54	33.52
	1	20.37	20.28	7.82	7.63	8.00	7.98	33.55	33.53
	2	20.10	20.20	7.91	7.66	7.99	7.98	33.63	33.52
	3	19.21	19.85	8.06	7.69	7.98	7.98	33.60	33.47
	4	18.73	17.28	7.97	8.24	7.98	7.94	33.54	33.58
	5	18.33	16.49	7.94	7.90	7.96	7.92	33.55	33.49
	6	18.27	16.48	7.83	7.75	7.95	7.92	33.55	33.51
RW4	0	20.40	20.48	7.64	7.91	8.00	8.00	33.55	33.55
	1	19.91	20.48	7.77	7.94	7.99	8.00	33.54	33.55
	2	19.17	20.46	7.86	7.97	7.97	8.01	33.55	33.55
	3	18.16	20.41	7.88	7.98	7.96	8.00	33.55	33.56
	4	17.16	19.62	7.85	8.13	7.95	7.98	33.54	33.74
	5	17.04	17.17	7.84	8.54	7.95	7.95	33.53	33.94
	6	17.01	16.79	7.94	8.09	7.95	7.93	33.54	33.63
RW5	0	20.16	20.05	7.97	7.93	8.00	8.00	33.40	33.49
	1	20.15	19.99	7.95	8.00	8.00	8.00	33.40	33.50
	2	20.03	19.84	7.97	8.02	8.00	8.00	33.45	33.51
	3	19.51	19.79	8.08	8.02	7.99	8.00	33.55	33.52
	4	19.02	19.72	7.91	8.05	7.97	7.99	33.58	33.53
	5	18.62	19.67	7.92	8.06	7.97	8.00	33.63	33.55
	6	17.09	19.58	8.13	8.06	7.93	7.99	33.54	33.55
	7	16.76	19.46	7.71	8.08	7.92	7.98	33.52	33.55
	8	16.64	19.31	7.66	8.07	7.91	7.98	33.52	33.53
	9	16.54	19.03	7.68	8.13	7.90	7.98	33.57	33.54
	10	16.25	18.05	7.59	8.28	7.89	7.97	33.57	33.60
	11	15.66	16.50	7.61	8.44	7.88	7.91	33.47	33.74
	12	15.57	15.99	7.46	8.08	7.88	7.89	33.54	33.56
	13	15.57	15.87	7.48	7.71	7.88	7.88	33.53	33.50
RW6	0	19.89	20.25	7.58	8.02	7.97	8.02	33.52	33.55
	1	19.41	20.26	7.80	7.99	7.96	8.02	33.53	33.55
	2	18.78	20.22	7.84	8.02	7.95	8.02	33.51	33.56
	3	17.59	20.09	7.82	8.07	7.94	8.00	33.53	33.57
	4	17.16	20.00	7.66	8.06	7.92	8.01	33.53	33.55
	5	17.01	19.88	7.74	8.08	7.92	8.00	33.51	33.57
	6	16.93	19.76	7.63	8.07	7.92	8.00	33.51	33.55
	7	16.65	19.70	7.72	8.06	7.91	7.99	33.49	33.54
	8	16.51	19.17	7.72	8.11	7.90	7.97	33.49	33.59
	9	16.33	18.32	7.60	8.15	7.90	7.95	33.49	33.65
	10	16.22	17.92	7.67	7.95	7.90	7.94	33.48	33.54
	11	16.11	16.56	7.72	8.05	7.90	7.91	33.48	33.66
	12	15.91	15.93	7.72	7.72	7.90	7.88	33.47	33.52
	13	15.67	15.78	7.69	7.46	7.88	7.88	33.51	33.48
	14	15.70		7.50		7.88		33.48	

Appendix C-2. (Cont.).

	Depth (m)	Temp. (°C) FLOOD	Temp. (°C) EBB	Oxygen (mg/l) FLOOD	Oxygen (mg/l) EBB	pH FLOOD	pH EBB	Salinity (ppt) FLOOD	Salinity (ppt) EBB
RW7	0	20.35	20.36	7.91	8.19	8.01	8.02	33.55	33.56
	1	20.20	20.33	7.93	8.23	8.00	8.02	33.54	33.55
	2	18.90	20.21	8.29	8.28	7.99	8.01	33.46	33.55
	3	17.87	19.80	8.29	8.34	7.97	8.00	33.54	33.53
	4	17.05	19.28	8.08	8.22	7.95	7.96	33.52	33.52
	5	16.35	18.80	8.29	7.98	7.96	7.95	33.54	33.53
	6	16.22	17.93	8.28	8.11	7.94	7.95	33.54	33.55
	7	16.05	16.90	8.29	8.28	7.96	7.93	33.52	33.52
	8	15.94	16.22	8.32	8.24	7.96	7.94	33.52	33.54
	9	15.85	15.83	8.39	8.33	7.96	7.94	33.51	33.51
	10	15.71	15.75	8.37	8.30	7.94	7.94	33.50	33.50
	11	15.63	15.71	8.30	8.29	7.94	7.94	33.49	33.49
	12	15.61	15.71	8.22	8.30	7.94	7.94	33.50	33.49
	13	15.62	15.72	8.18	8.25	7.94	7.94	33.50	33.49
	14	15.62		8.18		7.94		33.50	
RW8	0	20.23	20.25	7.94	8.14	8.00	8.00	33.54	33.56
	1	20.15	19.91	7.94	8.10	8.00	8.00	33.50	33.54
	2	19.44	19.20	8.05	8.45	7.99	7.98	33.55	33.55
	3	19.11	18.75	8.05	8.33	7.98	7.97	33.55	33.54
	4	18.87	18.27	8.04	8.24	7.99	7.96	33.56	33.54
	5	18.64	17.63	8.04	8.20	7.97	7.94	33.53	33.54
	6	18.28	17.36	8.00	8.07	7.97	7.94	33.51	33.49
	7	17.79	16.63	8.01	8.14	7.97	7.94	33.54	33.55
	8	17.65	16.07	8.01	8.22	7.97	7.94	33.53	33.49
	9	17.59	15.99	8.06	8.44	7.97	7.94	33.53	33.48
	10	17.45	15.96	8.12	8.30	7.97	7.94	33.52	33.48
	11	16.66	15.95	8.29	8.27	7.96	7.94	33.63	33.48
	12	15.87	15.95	8.39	8.23	7.95	7.94	33.71	33.48
	13	15.83	15.95	8.32	8.25	7.94	7.94	33.56	33.48
RW9	0	19.82	19.63	7.83	8.01	8.00	7.99	33.51	33.57
	1	19.75	19.50	7.86	8.04	7.99	7.99	33.54	33.57
	2	19.52	19.10	7.92	8.15	7.99	7.98	33.58	33.59
	3	19.08	18.70	7.97	8.11	7.98	7.97	33.59	33.59
	4	18.72	18.32	7.99	8.11	7.97	7.96	33.61	33.59
	5	18.22	17.90	8.03	8.15	7.96	7.95	33.63	33.59
	6	17.46	17.65	8.12	8.07	7.94	7.94	33.58	33.54
	7	17.00	17.62	8.01	8.00	7.92	7.95	33.51	33.54
	8	16.41	17.56	7.90	8.00	7.91	7.94	33.51	33.52
	9	15.95	17.52	7.81	8.01	7.91	7.93	33.42	33.52
	10	15.23	17.23	8.08	8.06	7.88	7.94	33.50	33.54
	11	15.16	16.56	7.82	8.13	7.88	7.92	33.47	33.58
	12	15.09	15.77	7.75	8.16	7.88	7.91	33.49	33.52
	13	15.06	15.53	7.84	8.02	7.88	7.90	33.47	33.52
	14	15.05	15.43	7.82	7.91	7.89	7.88	33.45	33.48
	15	14.99	15.32	7.81	7.84	7.88	7.89	33.45	33.46
	16	14.94	15.22	7.82	7.80	7.88	7.88	33.45	33.49
	17	14.92	15.12	7.79	7.77	7.88	7.88	33.45	33.46
	18	14.83	15.09	7.77	7.72	7.88	7.87	33.45	33.45
	19	14.73	15.10	7.74	7.72	7.86	7.87	33.46	33.45

Appendix C-2. (Cont.).

	Depth (m)	Temp. (°C) FLOOD	Temp. (°C) EBB	Oxygen (mg/l) FLOOD	Oxygen (mg/l) EBB	pH FLOOD	pH EBB	Salinity (ppt) FLOOD	Salinity (ppt) EBB
RW10	0	20.00	19.95	7.73	8.14	7.99	8.00	33.53	33.57
	1	19.70	19.92	7.80	8.14	7.99	8.01	33.51	33.56
	2	18.92	19.70	7.96	8.20	7.97	8.00	33.55	33.57
	3	18.71	19.67	7.84	8.18	7.95	8.00	33.51	33.57
	4	17.51	19.68	7.99	8.16	7.94	8.01	33.52	33.57
	5	17.19	19.63	7.77	8.15	7.93	8.00	33.58	33.56
	6	16.93	19.65	8.08	8.16	7.94	8.01	33.56	33.57
	7	16.37	19.60	8.27	8.17	7.94	8.01	33.56	33.57
	8	15.96	19.53	8.37	8.19	7.94	8.00	33.46	33.55
	9	15.69	19.64	8.39	8.16	7.94	8.01	33.59	33.56
	10	15.65	19.51	8.36	8.18	7.94	8.00	33.51	33.56
	11	15.49	19.28	8.35	8.22	7.94	8.00	33.50	33.55
	12	15.43	18.92	8.29	8.28	7.93	8.00	33.50	33.54
	13	15.37	18.13	8.28	8.40	7.92	7.98	33.49	33.53
	14	15.31	17.70	8.17	8.30	7.92	7.96	33.48	33.54
	15	15.21	17.33	8.17	8.14	7.91	7.96	33.47	33.52
	16	15.07	16.44	8.07	8.30	7.90	7.94	33.47	33.50
	17	14.81	15.58	8.00	8.38	7.90	7.92	33.47	33.53
	18	14.65	15.12	8.05	8.07	7.90	7.88	33.46	33.47
	19	14.70	14.92	7.98	7.67	7.90	7.87	33.42	33.51
	20	14.42		8.05		7.90		33.49	
RW11	0	20.42	20.22	7.98	8.16	8.02	8.01	33.58	33.57
	1	20.37	20.20	7.98	8.10	8.02	8.01	33.56	33.57
	2	19.47	19.87	8.20	8.26	8.01	8.01	33.52	33.53
	3	18.19	18.45	8.40	8.54	7.98	7.98	33.56	33.60
	4	17.97	17.74	8.18	8.39	7.97	7.97	33.54	33.55
	5	17.60	17.39	8.13	8.34	7.97	7.95	33.53	33.53
	6	17.42	16.93	8.17	8.41	7.97	7.96	33.53	33.52
	7	17.32	16.39	8.20	8.50	7.96	7.96	33.52	33.54
	8	17.30	16.25	8.18	8.50	7.96	7.96	33.53	33.54
	9	17.18	16.16	8.18	8.55	7.96	7.96	33.53	33.54
	10	16.26	16.01	8.37	8.60	7.96	7.96	33.61	33.53
	11	15.70	15.90	8.53	8.59	7.96	7.96	33.52	33.53
	12	15.27	15.90	8.48	8.55	7.95	7.96	33.53	33.52
	13	15.14	15.89	8.46	8.54	7.94	7.96	33.50	33.52
	14	15.08	15.89	8.45	8.53	7.94	7.96	33.54	33.51
	15	15.01	15.86	8.45	8.53	7.94	7.96	33.49	33.51
	16	15.01	15.77	8.39	8.55	7.94	7.94	33.50	33.49
	17	15.00	15.61	8.34	8.49	7.94	7.94	33.49	33.46
	18	15.00	15.25	8.37	8.51	7.95	7.93	33.49	33.46
	19	15.00	14.98	8.34	8.40	7.94	7.93	33.49	33.47
RW12	0	19.67	20.23	7.81	8.16	7.99	8.00	33.53	33.57
	1	19.51	20.23	7.82	8.17	7.98	8.00	33.55	33.57
	2	18.85	20.17	8.00	8.18	7.97	8.00	33.57	33.57
	3	18.25	20.13	8.03	8.19	7.97	8.00	33.58	33.57
	4	18.07	20.03	7.98	8.21	7.96	8.00	33.56	33.56
	5	17.19	19.67	8.26	8.28	7.97	8.00	33.49	33.57
	6	16.16	19.10	8.39	8.40	7.96	7.99	33.55	33.50
	7	15.80	18.14	8.47	8.49	7.96	7.98	33.53	33.57
	8	15.57	17.32	8.49	8.48	7.94	7.96	33.54	33.51
	9	15.49	16.79	8.45	8.44	7.95	7.95	33.52	33.57
	10	15.35	16.47	8.47	8.51	7.95	7.96	33.51	33.53
	11	15.21	16.33	8.51	8.50	7.94	7.96	33.52	33.53
	12	15.11	16.20	8.49	8.53	7.95	7.96	33.50	33.52
	13	15.08	16.09	8.43	8.55	7.94	7.96	33.50	33.52
	14	15.05	16.01	8.37	8.51	7.94	7.95	33.49	33.51
	15	15.04	15.90	8.37	8.46	7.94	7.94	33.49	33.49
	16	15.00	15.70	8.39	8.47	7.94	7.94	33.48	33.50
	17	14.85	15.59	8.39	8.42	7.94	7.94	33.48	33.49
	18	14.77	15.41	8.41	8.42	7.93	7.95	33.48	33.48
	19	14.78	15.24	8.38	8.43	7.93	7.94	33.48	33.50
	20	14.76		8.34		7.92		33.48	

APPENDIX D

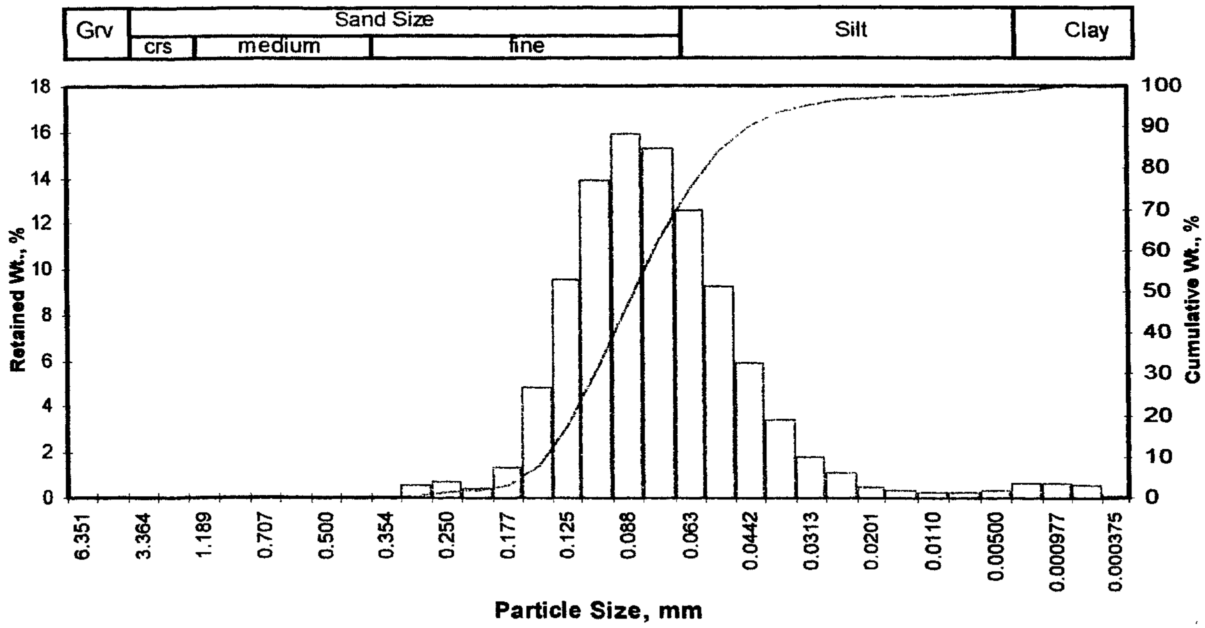
Sediment grain size distribution and statistical parameters by station

Appendix D. Sediment grain size distribution and statistical parameters by station. El Segundo and Scattergood Generating Stations NPDES, 2001.

Station B1

PTS Laboratories, Inc. — **Particle Size Analysis - ASTM D4464M**

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-01
Project No:	IKJ0315	**Depth, ft:**	N/A



Opening		Phi of	U.S.	Sample Weight,	Increment Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0 00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.02	0.02	0.02
0.0117	0.297	1.75	50	0.56	0.56	0.58
0.0098	0.250	2.00	60	0.74	0.73	1.31
0.0083	0.210	2.25	70	0.41	0.41	1.72
0.0070	0.177	2.50	80	1.31	1.31	3.03
0.0059	0.149	2.75	100	4.79	4.79	7.82
0.0049	0.125	3.00	120	9.54	9.54	17.36
0.0041	0.105	3.25	140	13.90	13.90	31.26
0.0035	0.088	3.50	170	15.91	15.91	47.17
0.0029	0.074	3.75	200	15.26	15.26	62.43
0.0025	0.063	4.00	230	12.60	12.60	75.03
0.0021	0.053	4.25	270	9.20	9.20	84.23
0.00174	0.0442	4.50	325	5.88	5.88	90.11
0.00146	0.0372	4.75	400	3.42	3.42	93.53
0.00123	0.0313	5.00	450	1.81	1.81	95.34
0.000986	0.0250	5.32	500	1.10	1.10	96.44
0.000790	0.0201	5.64	635	0.50	0.50	96.94
0.000615	0.0156	6.00		0.31	0.31	97.25
0.000435	0.0110	6.50		0.26	0.26	97.51
0.000308	0 00781	7.00		0.24	0.24	97.75
0.000197	0.00500	7.65		0.35	0.35	98.10
0.000077	0.00195	9.00		0.65	0.64	98.75
0.000038	0.000977	10.00		0.66	0.66	99.41
0.000019	0.000488	11.00		0.54	0.54	99.94
0.000015	0.000375	11.38		0.06	0.06	100.00
TOTALS				100.00	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	2.60	0.0065	0.165
10	2.81	0.0056	0.143
16	2.96	0.0050	0.128
25	3.14	0.0045	0.114
40	3.39	0.0038	0.096
50	3.55	0.0034	0.086
60	3.71	0.0030	0.076
75	4.00	0.0025	0.063
84	4.24	0.0021	0.053
90	4.50	0.0017	0.044
95	4.95	0.0013	0.032

Measure	Trask	Inman	Folk-Ward
Median, phi	3.55	3.55	3.55
Median, in.	0.0034	0.0034	0.0034
Median, mm	0.086	0.086	0.086
Mean, phi	3.50	3.60	3.58
Mean, in.	0.0035	0.0032	0.0033
Mean, mm	0.088	0.082	0.083
Sorting	0.742	0.640	0.676
Skewness	0.985	0.090	0.143
Kurtosis	0.259	0.837	1.117
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	62.43
Silt	>0.005 mm	35.67
Clay	<0.005 mm	1.90
	Total	100

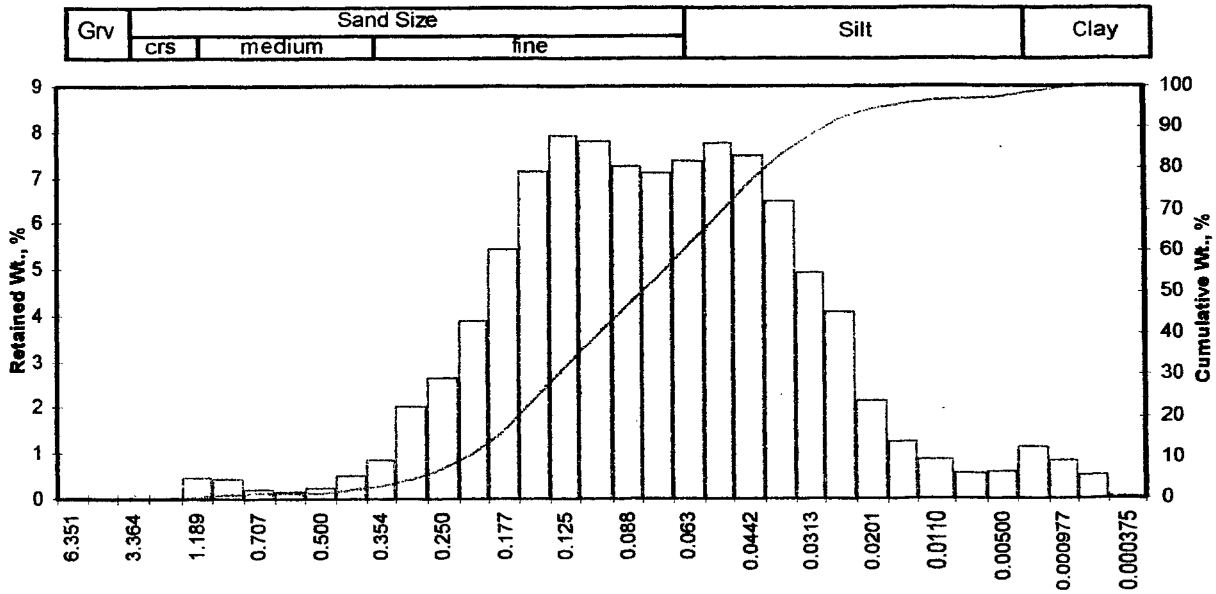
Phone: (562) 907-3607 Fax: (562) 907-3610

Appendix D. (Cont.).

Station B2

PTS Laboratories, Inc. — **Particle Size Analysis - ASTM D4464M**

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-02
Project No:	IKJ0315	**Depth, ft:**	N/A



Opening		Phi of	U.S.	Sample Weight,	Increment Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.48	0.48	0.48
0.0331	0.841	0.25	20	0.44	0.44	0.92
0.0278	0.707	0.50	25	0.21	0.21	1.13
0.0234	0.595	0.75	30	0.16	0.16	1.29
0.0197	0.500	1.00	35	0.22	0.22	1.51
0.0166	0.420	1.25	40	0.51	0.51	2.02
0.0139	0.354	1.50	45	0.85	0.85	2.87
0.0117	0.297	1.75	50	2.02	2.02	4.89
0.0098	0.250	2.00	60	2.65	2.65	7.54
0.0083	0.210	2.25	70	3.87	3.87	11.41
0.0070	0.177	2.50	80	5.44	5.44	16.85
0.0059	0.149	2.75	100	7.15	7.15	24.00
0.0049	0.125	3.00	120	7.92	7.92	31.92
0.0041	0.105	3.25	140	7.78	7.78	39.71
0.0035	0.088	3.50	170	7.25	7.25	46.96
0.0029	0.074	3.75	200	7.08	7.08	54.04
0.0025	0.063	4.00	230	7.38	7.38	61.42
0.0021	0.053	4.25	270	7.74	7.74	69.16
0.00174	0.0442	4.50	325	7.50	7.50	76.66
0.00146	0.0372	4.75	400	6.46	6.46	83.12
0.00123	0.0313	5.00	450	4.91	4.91	88.03
0.000986	0.0250	5.32	500	4.08	4.08	92.11
0.000790	0.0201	5.64	635	2.15	2.15	94.26
0.000615	0.0156	6.00		1.24	1.24	95.50
0.000435	0.0110	6.50		0.85	0.85	96.35
0.000308	0.00781	7.00		0.55	0.55	96.90
0.000197	0.00500	7.65		0.59	0.59	97.49
0.000077	0.00195	9.00		1.13	1.13	98.62
0.000038	0.000977	10.00		0.82	0.82	99.43
0.000019	0.000488	11.00		0.51	0.51	99.95
0.000015	0.000375	11.38		0.05	0.05	100.00
TOTALS				100.00	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	1.76	0.0116	0.295
10	2.16	0.0088	0.224
16	2.46	0.0072	0.182
25	2.78	0.0057	0.145
40	3.26	0.0041	0.104
50	3.61	0.0032	0.082
60	3.95	0.0025	0.065
75	4.44	0.0018	0.046
84	4.79	0.0014	0.036
90	5.15	0.0011	0.028
95	5.85	0.0007	0.017

Measure	Trask	Inman	Folk-Ward
Median, phi	3.61	3.61	3.61
Median, in.	0.0032	0.0032	0.0032
Median, mm	0.082	0.082	0.082
Mean, phi	3.39	3.63	3.62
Mean, in.	0.0038	0.0032	0.0032
Mean, mm	0.096	0.081	0.081
Sorting	0.562	1.167	1.204
Skewness	0.996	0.017	0.058
Kurtosis	0.254	0.754	1.009

Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	2.02
Fine Sand	200	52.02
Silt	>0.005 mm	43.45
Clay	<0.005 mm	2.51
	Total	100

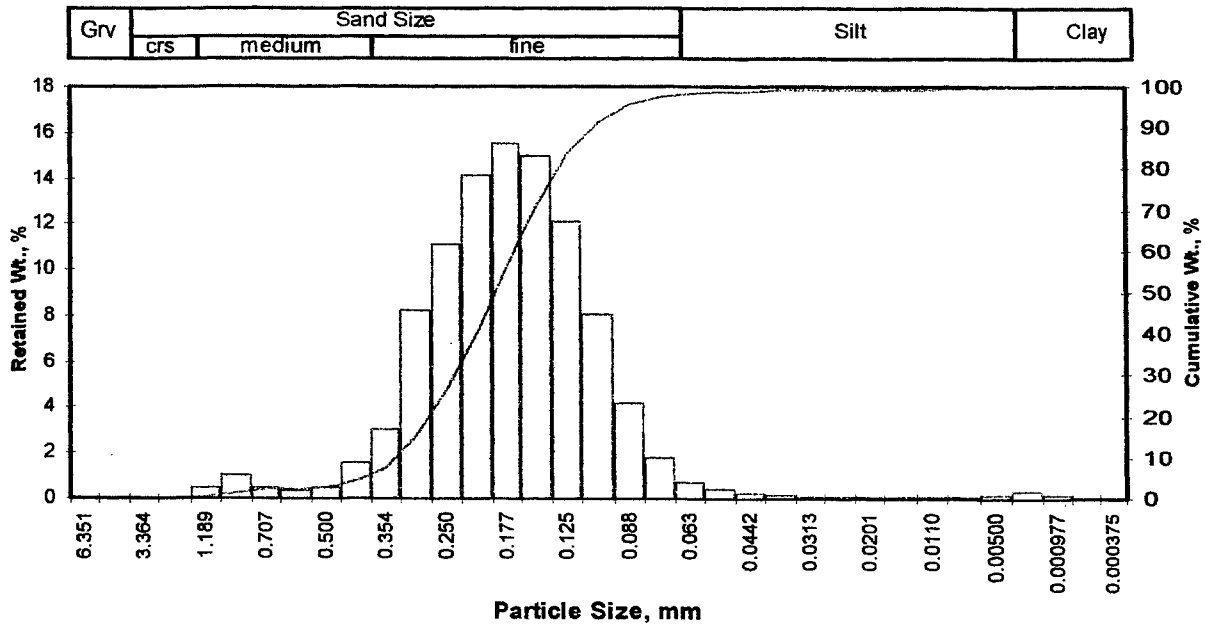
Phone: (562) 907-3607 Fax: (562) 907-3610

Appendix D. (Cont.).

Station B3

PTS Laboratories, Inc. — **Particle Size Analysis - ASTM D4464M**

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-03
Project No:	IKJ0315	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.44	0.44	0.44
0.0331	0.841	0.25	20	1.01	1.01	1.45
0.0278	0.707	0.50	25	0.50	0.50	1.94
0.0234	0.595	0.75	30	0.34	0.34	2.28
0.0197	0.500	1.00	35	0.50	0.50	2.78
0.0166	0.420	1.25	40	1.57	1.57	4.35
0.0139	0.354	1.50	45	3.02	3.02	7.37
0.0117	0.297	1.75	50	8.21	8.21	15.59
0.0098	0.250	2.00	60	11.08	11.08	26.67
0.0083	0.210	2.25	70	14.15	14.15	40.82
0.0070	0.177	2.50	80	15.54	15.54	56.36
0.0059	0.149	2.75	100	15.01	15.01	71.37
0.0049	0.125	3.00	120	12.13	12.13	83.50
0.0041	0.105	3.25	140	8.05	8.05	91.56
0.0035	0.088	3.50	170	4.20	4.20	95.76
0.0029	0.074	3.75	200	1.76	1.76	97.52
0.0025	0.063	4.00	230	0.69	0.69	98.21
0.0021	0.053	4.25	270	0.37	0.37	98.58
0.00174	0.0442	4.50	325	0.24	0.24	98.81
0.00146	0.0372	4.75	400	0.15	0.15	98.97
0.00123	0.0313	5.00	450	0.10	0.10	99.06
0.000986	0.0250	5.32	500	0.09	0.09	99.15
0.000790	0.0201	5.64	635	0.07	0.07	99.22
0.000615	0.0156	6.00		0.06	0.06	99.28
0.000435	0.0110	6.50		0.07	0.07	99.35
0.000308	0.00781	7.00		0.08	0.08	99.42
0.000197	0.00500	7.65		0.13	0.13	99.55
0.000077	0.00195	9.00		0.31	0.31	99.86
0.000038	0.000977	10.00		0.13	0.13	99.99
0.000019	0.000488	11.00		0.01	0.01	100.00
0.000015	0.000375	11.38		0.00	0.00	100.00
TOTALS				100.00	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	1.30	0.0160	0.405
10	1.58	0.0132	0.334
16	1.76	0.0116	0.295
25	1.96	0.0101	0.257
40	2.24	0.0084	0.212
50	2.40	0.0075	0.190
60	2.56	0.0067	0.170
75	2.82	0.0056	0.141
84	3.02	0.0049	0.124
90	3.20	0.0043	0.109
95	3.45	0.0036	0.091

Measure	Trask	Inman	Folk-Ward
Median, phi	2.40	2.40	2.40
Median, in.	0.0075	0.0075	0.0075
Median, mm	0.190	0.190	0.190
Mean, phi	2.33	2.39	2.39
Mean, in.	0.0078	0.0075	0.0075
Mean, mm	0.199	0.191	0.191
Sorting	0.742	0.628	0.640
Skewness	1.003	-0.016	-0.017
Kurtosis	0.256	0.713	1.023
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	4.35
Fine Sand	200	93.16
Silt	>0.005 mm	2.03
Clay	<0.005 mm	0.45
	Total	100

Phone: (562) 907-3607 Fax: (562) 907-3610

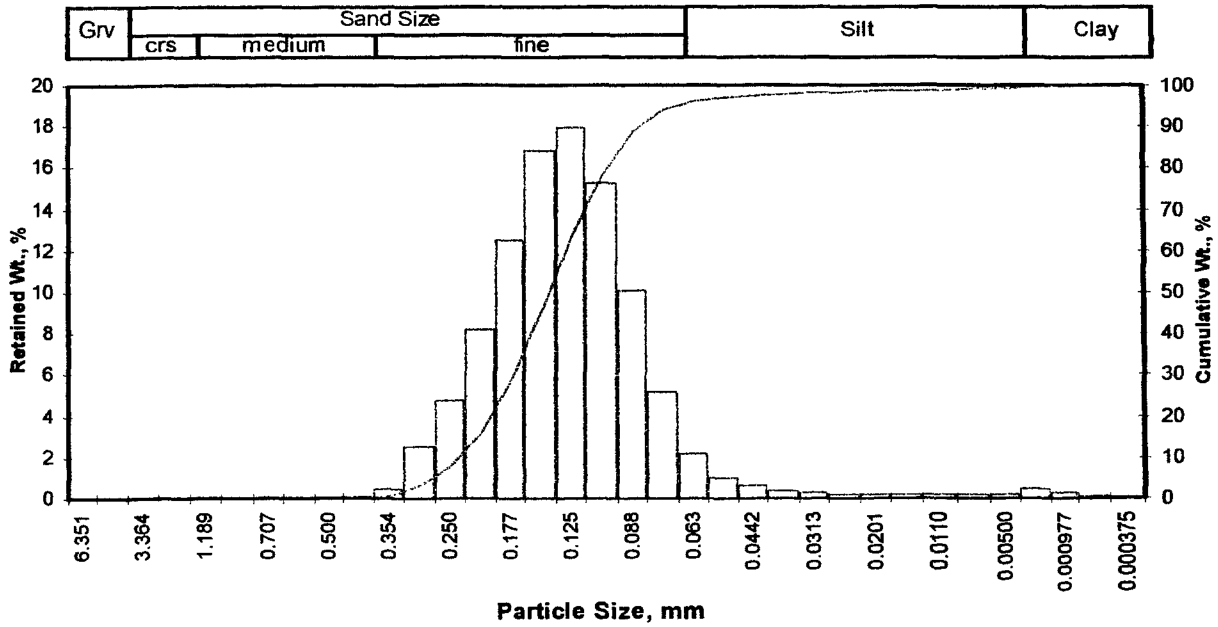
Appendix D. (Cont.).

Station B4

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-04
Project No:	IKJ0315	**Depth, ft:**	N/A



Opening		Phi of	U.S.	Sample	Increment	Cumulative
Inches	Millimeters	Screen	No.	Weight, grams	Weight, percent	Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.05	0.05	0.05
0.0139	0.354	1.50	45	0.47	0.47	0.51
0.0117	0.297	1.75	50	2.53	2.53	3.04
0.0098	0.250	2.00	60	4.78	4.78	7.82
0.0083	0.210	2.25	70	8.20	8.20	16.02
0.0070	0.177	2.50	80	12.51	12.51	28.54
0.0059	0.149	2.75	100	16.82	16.82	45.36
0.0049	0.125	3.00	120	17.96	17.96	63.32
0.0041	0.105	3.25	140	15.28	15.28	78.60
0.0035	0.088	3.50	170	10.05	10.05	88.66
0.0029	0.074	3.75	200	5.13	5.13	93.79
0.0025	0.063	4.00	230	2.17	2.17	95.96
0.0021	0.053	4.25	270	0.99	0.99	96.94
0.00174	0.0442	4.50	325	0.59	0.59	97.53
0.00146	0.0372	4.75	400	0.39	0.39	97.92
0.00123	0.0313	5.00	450	0.24	0.24	98.16
0.000986	0.0250	5.32	500	0.20	0.20	98.35
0.000790	0.0201	5.64	635	0.14	0.14	98.49
0.000615	0.0156	6.00		0.14	0.14	98.63
0.000435	0.0110	6.50		0.17	0.17	98.80
0.000308	0.00781	7.00		0.16	0.16	98.95
0.000197	0.00500	7.65		0.20	0.20	99.15
0.000077	0.00195	9.00		0.47	0.47	99.63
0.000038	0.000977	10.00		0.29	0.29	99.91
0.000019	0.000488	11.00		0.09	0.09	100.00
0.000015	0.000375	11.38		0.00	0.00	100.00
TOTALS				100.00	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	1.85	0.0109	0.277
10	2.07	0.0094	0.239
16	2.25	0.0083	0.210
25	2.43	0.0073	0.186
40	2.67	0.0062	0.157
50	2.81	0.0056	0.142
60	2.95	0.0051	0.129
75	3.19	0.0043	0.109
84	3.38	0.0038	0.096
90	3.57	0.0033	0.084
95	3.89	0.0027	0.067

Measure	Trask	Inman	Folk-Ward
Median, phi	2.81	2.81	2.81
Median, in.	0.0056	0.0056	0.0056
Median, mm	0.142	0.142	0.142
Mean, phi	2.76	2.82	2.82
Mean, in.	0.0058	0.0056	0.0056
Mean, mm	0.148	0.142	0.142
Sorting	0.768	0.567	0.592
Skewness	1.003	0.004	0.030
Kurtosis	0.247	0.795	1.096
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.05
Fine Sand	200	93.74
Silt	>0.005 mm	5.37
Clay	<0.005 mm	0.85
	Total	100

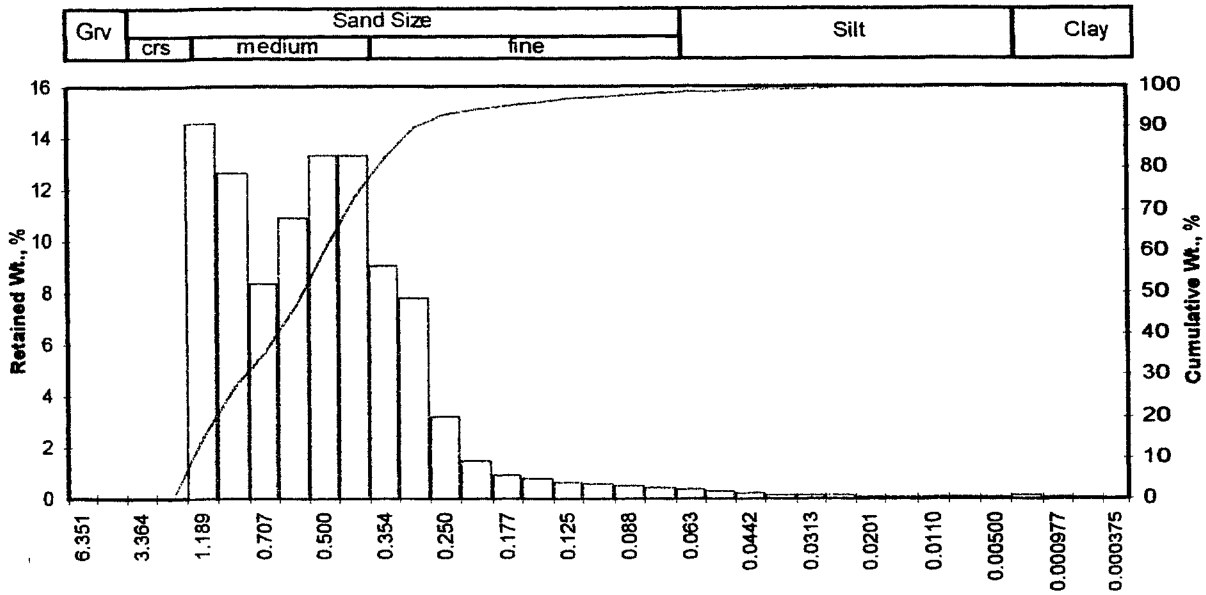
Phone: (562) 907-3607 Fax: (562) 907-3610

Appendix D. (Cont.).

Station B5

PTS Laboratories, Inc. **Particle Size Analysis - ASTM D4464M**

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-05
Project No:	IKJ0315	**Depth, ft:**	N/A



Particle Size, mm

Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	14.53	14.53	14.53
0.0331	0.841	0.25	20	12.64	12.64	27.17
0.0278	0.707	0.50	25	8.34	8.34	35.51
0.0234	0.595	0.75	30	10.93	10.93	46.44
0.0197	0.500	1.00	35	13.34	13.34	59.77
0.0166	0.420	1.25	40	13.33	13.33	73.10
0.0139	0.354	1.50	45	9.04	9.04	82.14
0.0117	0.297	1.75	50	7.81	7.81	89.95
0.0098	0.250	2.00	60	3.15	3.15	93.10
0.0083	0.210	2.25	70	1.46	1.46	94.56
0.0070	0.177	2.50	80	0.88	0.88	95.44
0.0059	0.149	2.75	100	0.74	0.74	96.18
0.0049	0.125	3.00	120	0.66	0.65	96.84
0.0041	0.105	3.25	140	0.58	0.57	97.41
0.0035	0.088	3.50	170	0.49	0.49	97.90
0.0029	0.074	3.75	200	0.40	0.39	98.30
0.0025	0.063	4.00	230	0.33	0.32	98.62
0.0021	0.053	4.25	270	0.26	0.26	98.89
0.00174	0.0442	4.50	325	0.19	0.19	99.08
0.00146	0.0372	4.75	400	0.14	0.14	99.23
0.00123	0.0313	5.00	450	0.11	0.11	99.34
0.000986	0.0250	5.32	500	0.11	0.11	99.45
0.000790	0.0201	5.64	635	0.08	0.08	99.53
0.000615	0.0156	6.00		0.07	0.07	99.60
0.000435	0.0110	6.50		0.08	0.08	99.69
0.000308	0.00781	7.00		0.07	0.07	99.76
0.000197	0.00500	7.65		0.08	0.08	99.83
0.000077	0.00195	9.00		0.12	0.12	99.96
0.000038	0.000977	10.00		0.04	0.04	100.00
0.000019	0.000488	11.00		0.00	0.00	100.00
0.000015	0.000375	11.38		0.00	0.00	100.00
TOTALS				**100.00**	**100.00**	**100.00**

Cumulative Weight Percent greater than			
Weight percent	**Phi Value**	**Particle Size Inches**	**Particle Size Millimeters**
5	-0.74	0.0658	1.672
10	-0.48	0.0551	1.398
16	-0.19	0.0450	1.142
25	0.16	0.0351	0.892
40	0.60	0.0259	0.658
50	0.82	0.0224	0.568
60	1.00	0.0196	0.499
75	1.30	0.0160	0.405
84	1.56	0.0134	0.339
90	1.75	0.0117	0.297
95	2.37	0.0076	0.193

Measure	Trask	Inman	Folk-Ward
Median, phi	0.82	0.82	0.82
Median, in.	0.0224	0.0224	0.0224
Median, mm	0.568	0.568	0.568
Mean, phi	0.62	0.68	0.73
Mean, in.	0.0255	0.0245	0.0238
Mean, mm	0.649	0.623	0.604
Sorting	0.674	0.876	0.910
Skewness	1.060	-0.152	-0.076
Kurtosis	0.221	0.779	1.122
Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	73.10
Fine Sand	200	25.20
Silt	>0.005 mm	1.53
Clay	<0.005 mm	0.17
	Total	**100**

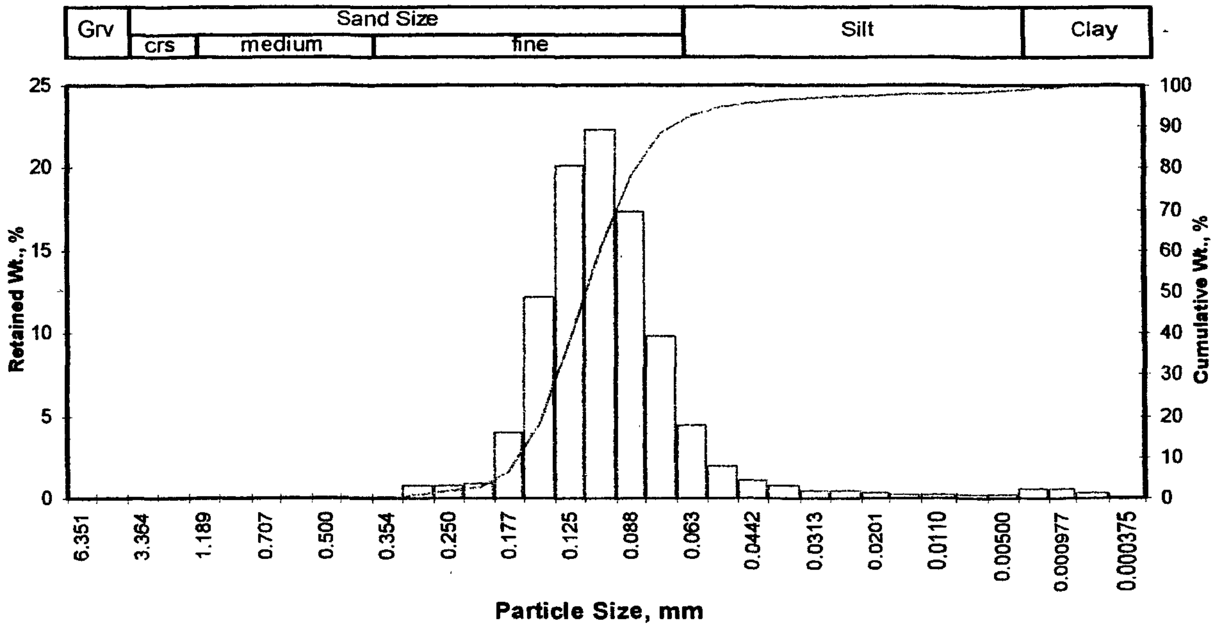
Appendix D. (Cont.).

Station B6

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-06
Project No:	IKJ0315	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.05	0.05	0.05
0.0117	0.297	1.75	50	0.77	0.77	0.82
0.0098	0.250	2.00	60	0.78	0.78	1.60
0.0083	0.210	2.25	70	0.87	0.86	2.46
0.0070	0.177	2.50	80	3.99	3.99	6.45
0.0059	0.149	2.75	100	12.19	12.19	18.64
0.0049	0.125	3.00	120	20.17	20.17	38.81
0.0041	0.105	3.25	140	22.32	22.32	61.13
0.0035	0.088	3.50	170	17.34	17.34	78.47
0.0029	0.074	3.75	200	9.83	9.83	88.30
0.0025	0.063	4.00	230	4.37	4.37	92.67
0.0021	0.053	4.25	270	1.96	1.96	94.63
0.00174	0.0442	4.50	325	1.11	1.11	95.74
0.00146	0.0372	4.75	400	0.72	0.72	96.46
0.00123	0.0313	5.00	450	0.46	0.46	96.92
0.000986	0.0250	5.32	500	0.40	0.40	97.31
0.000790	0.0201	5.64	635	0.28	0.28	97.60
0.000615	0.0156	6.00		0.23	0.23	97.83
0.000435	0.0110	6.50		0.23	0.23	98.06
0.000308	0.00781	7.00		0.20	0.20	98.26
0.000197	0.00500	7.65		0.24	0.24	98.50
0.000077	0.00195	9.00		0.58	0.58	99.08
0.000038	0.000977	10.00		0.53	0.53	99.62
0.000019	0.000488	11.00		0.35	0.35	99.97
0.000015	0.000375	11.38		0.03	0.03	100.00
TOTALS				**100.00**	**100.00**	**100.00**

Cumulative Weight Percent greater than: Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	2.41	0.0074	0.188
10	2.57	0.0066	0.168
16	2.70	0.0061	0.154
25	2.83	0.0055	0.141
40	3.01	0.0049	0.124
50	3.13	0.0045	0.115
60	3.24	0.0042	0.106
75	3.45	0.0036	0.092
84	3.64	0.0032	0.080
90	3.85	0.0027	0.069
95	4.33	0.0020	0.050

Measure	Trask	Inman	Folk-Ward
Median, phi	3.13	3.13	3.13
Median, in.	0.0045	0.0045	0.0045
Median, mm	0.115	0.115	0.115
Mean, phi	3.11	3.17	3.15
Mean, in.	0.0046	0.0044	0.0044
Mean, mm	0.116	0.111	0.112
Sorting	0.806	0.472	0.528
Skewness	0.990	0.091	0.173
Kurtosis	0.250	1.037	1.270
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	88.30
Silt	>0.005 mm	10.20
Clay	<0.005 mm	1.50
	Total	100

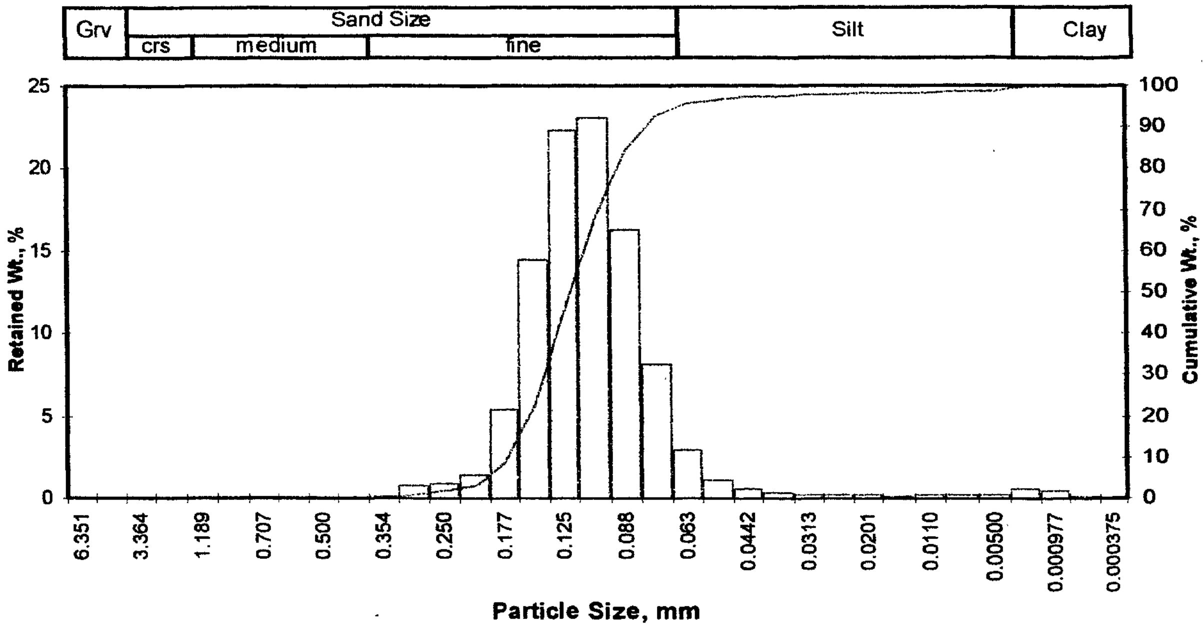
 Phone: (562) 907-3607 Fax: (562) 907-3610

Appendix D. (Cont.).

Station B7

PTS Laboratories, Inc. — **Particle Size Analysis - ASTM D4464M**

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-07
Project No:	IKJ0315	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.06	0.06	0.06
0.0117	0.297	1.75	50	0.79	0.79	0.85
0.0098	0.250	2.00	60	0.90	0.90	1.75
0.0083	0.210	2.25	70	1.38	1.38	3.13
0.0070	0.177	2.50	80	5.34	5.34	8.47
0.0059	0.149	2.75	100	14.47	14.47	22.94
0.0049	0.125	3.00	120	22.33	22.33	45.28
0.0041	0.105	3.25	140	23.04	23.04	68.32
0.0035	0.088	3.50	170	16.30	16.30	84.62
0.0029	0.074	3.75	200	8.05	8.05	92.67
0.0025	0.063	4.00	230	2.90	2.90	95.57
0.0021	0.053	4.25	270	1.06	1.06	96.63
0.00174	0.0442	4.50	325	0.57	0.57	97.20
0.00146	0.0372	4.75	400	0.36	0.36	97.56
0.00123	0.0313	5.00	450	0.22	0.22	97.78
0.000986	0.0250	5.32	500	0.21	0.21	97.99
0.000790	0.0201	5.64	635	0.17	0.17	98.16
0.000615	0.0156	6.00		0.15	0.15	98.31
0.000435	0.0110	6.50		0.17	0.17	98.48
0.000308	0.00781	7.00		0.16	0.16	98.64
0.000197	0.00500	7.65		0.20	0.20	98.85
0.000077	0.00195	9.00		0.55	0.55	99.40
0.000038	0.000977	10.00		0.45	0.45	99.84
0.000019	0.000488	11.00		0.16	0.16	100.00
0.000015	0.000375	11.38		0.00	0.00	100.00
TOTALS				100.00	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	**Phi Value**	**Particle Size Inches**	**Particle Size Millimeters**
5	2.34	0.0078	0.198
10	2.53	0.0068	0.174
16	2.63	0.0064	0.162
25	2.77	0.0058	0.146
40	2.94	0.0051	0.130
50	3.05	0.0047	0.121
60	3.16	0.0044	0.112
75	3.35	0.0039	0.098
84	3.49	0.0035	0.089
90	3.67	0.0031	0.079
95	3.95	0.0025	0.065

Measure	Trask	Inman	Folk-Ward
Median, phi	3.05	3.05	3.05
Median, in.	0.0047	0.0047	0.0047
Median, mm	0.121	0.121	0.121
Mean, phi	3.03	3.06	3.06
Mean, in.	0.0048	0.0047	0.0047
Mean, mm	0.122	0.120	0.120
Sorting	0.818	0.430	0.460
Skewness	0.992	0.021	0.068
Kurtosis	0.255	0.875	1.141
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	92.67
Silt	>0.005 mm	6.18
Clay	<0.005 mm	1.15
	Total	100

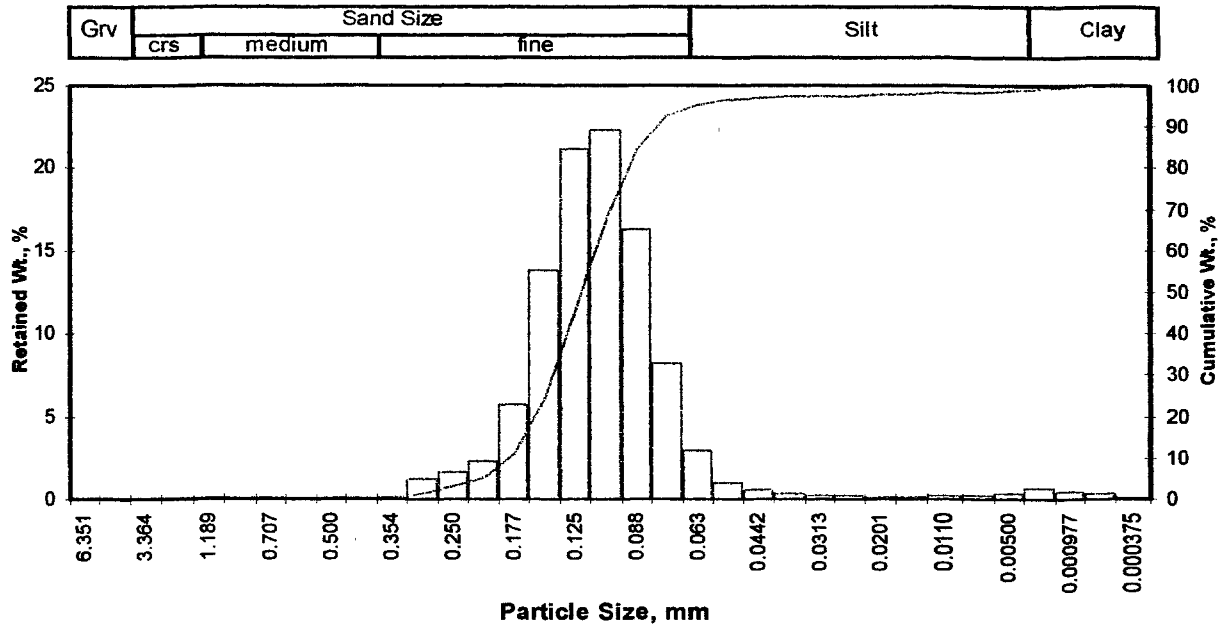
Phone: (562) 907-3607 Fax: (562) 907-3610

Appendix D. (Cont.).

Station B8

PTS Laboratories, Inc. — **Particle Size Analysis - ASTM D4464M**

Client:	Del Mar Analytical	**PTS File No:**	31587
Project:	N/A	**Sample ID:**	IKJ0315-08
Project No:	IKJ0315	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.08	0.08	0.08
0.0117	0.297	1.75	50	1.17	1.17	1.25
0.0098	0.250	2.00	60	1.67	1.67	2.92
0.0083	0.210	2.25	70	2.26	2.26	5.18
0.0070	0.177	2.50	80	5.73	5.73	10.91
0.0059	0.149	2.75	100	13.80	13.80	24.71
0.0049	0.125	3.00	120	21.13	21.13	45.83
0.0041	0.105	3.25	140	22.28	22.28	68.11
0.0035	0.088	3.50	170	16.25	16.25	84.36
0.0029	0.074	3.75	200	8.19	8.19	92.55
0.0025	0.063	4.00	230	2.88	2.88	95.43
0.0021	0.053	4.25	270	0.95	0.95	96.38
0.00174	0.0442	4.50	325	0.51	0.51	96.89
0.00146	0.0372	4.75	400	0.34	0.33	97.23
0.00123	0.0313	5.00	450	0.20	0.20	97.43
0.000986	0.0250	5.32	500	0.17	0.17	97.60
0.000790	0.0201	5.64	635	0.16	0.15	97.76
0.000615	0.0156	6.00		0.16	0.15	97.91
0.000435	0.0110	6.50		0.19	0.19	98.10
0.000308	0.00781	7.00		0.20	0.20	98.31
0.000197	0.00500	7.65		0.28	0.28	98.59
0.000077	0.00195	9.00		0.64	0.64	99.22
0.000038	0.000977	10.00		0.47	0.47	99.69
0.000019	0.000488	11.00		0.28	0.28	99.97
0.000015	0.000375	11.38		0.03	0.03	100.00
TOTALS				100.00	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size Inches	Particle Size Millimeters
5	2.23	0.0084	0.213
10	2.46	0.0072	0.182
16	2.59	0.0065	0.166
25	2.75	0.0058	0.148
40	2.93	0.0052	0.131
50	3.05	0.0048	0.121
60	3.16	0.0044	0.112
75	3.36	0.0038	0.098
84	3.49	0.0035	0.089
90	3.67	0.0031	0.078
95	3.96	0.0025	0.064

Measure	Trask	Inman	Folk-Ward
Median, phi	3.05	3.05	3.05
Median, in.	0.0048	0.0048	0.0048
Median, mm	0.121	0.121	0.121
Mean, phi	3.02	3.04	3.04
Mean, in.	0.0048	0.0048	0.0048
Mean, mm	0.123	0.121	0.121
Sorting	0.812	0.451	0.488
Skewness	0.994	-0.008	0.025
Kurtosis	0.245	0.920	1.178
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	92.55
Silt	>0.005 mm	6.03
Clay	<0.005 mm	1.41
	Total	100

Appendix D-1. Yearly grain size values, 1990 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Year	Station	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean grain size phi	Mean grain size µm	Sorting	Skewness	Kurtosis
2001	B1	0.00	75.03	23.07	1.90	3.58	83	0.68	0.14	1.12
	B2	0.00	61.42	36.07	2.51	3.62	81	1.20	0.06	1.01
	B3	0.00	98.21	1.34	0.45	2.39	191	0.64	-0.02	1.02
	B4	0.00	95.96	3.19	0.85	2.82	142	0.59	0.03	1.10
	B5	0.00	98.62	1.21	0.17	0.73	604	0.91	-0.08	1.12
	B6	0.00	92.67	5.83	1.50	3.15	112	0.53	0.17	1.27
	B7	0.00	95.57	3.28	1.15	3.06	120	0.46	0.07	1.14
	B8	0.00	95.43	3.16	1.41	3.04	121	0.49	0.03	1.18
2000	B1	0.00	98.15	1.53	0.32	1.08	472	1.04	0.28	1.09
	B2	0.00	94.59	4.49	0.92	2.43	185	0.88	0.04	1.02
	B3	0.00	97.22	2.21	0.57	2.36	195	0.66	-0.01	1.12
	B4	0.00	96.92	2.43	0.65	2.46	182	0.67	0.05	1.05
	B5	0.00	79.06	18.95	1.99	3.53	87	0.82	0.06	1.68
	B6	0.00	91.55	7.13	1.32	3.10	117	0.69	0.05	1.61
	B7	0.00	92.97	5.70	1.33	3.12	115	0.55	0.16	1.31
	B8	0.00	92.94	5.47	1.59	3.19	109	0.52	0.17	1.33
1999	B1	0.00	88.78	10.00	1.22	2.64	161	1.23	-0.14	1.06
	B2	0.00	84.37	14.04	1.59	3.01	124	1.07	0.06	1.47
	B3	0.00	97.82	1.60	0.58	2.47	181	0.59	-0.06	1.08
	B4	0.00	95.72	3.34	0.94	2.67	158	0.99	-0.33	1.73
	B5	0.00	99.30	0.67	0.03	0.71	612	0.86	-0.11	1.07
	B6	0.00	92.76	5.64	1.60	3.07	119	0.63	0.08	1.48
	B7	0.00	93.90	4.60	1.50	3.05	121	0.53	0.12	1.28
	B8	0.00	94.20	4.36	1.44	3.13	114	0.50	0.08	1.24
1998	B1	-	-	-	-	-	-	-	-	-
	B2	0.00	81.67	16.76	1.57	3.45	92	58.08	0.30	1.39
	B3	0.00	100.00	0.00	0.00	2.30	203	65.70	-0.01	0.92
	B4	-	-	-	-	-	-	-	-	-
	B5	-	-	-	-	-	-	-	-	-
	B6	0.00	94.08	4.86	1.06	3.32	100	70.21	0.09	1.46
	B7	0.00	95.03	4.09	0.87	3.38	96	76.74	0.08	1.29
	B8	-	-	-	-	-	-	-	-	-
1997	B1	0.02	91.05	7.95	0.98	3.19	110	61.33	-0.18	1.44
	B2	0.00	80.59	18.06	1.35	3.57	84	62.79	0.36	1.41
	B3	0.07	98.92	0.69	0.32	2.63	162	66.05	-0.19	1.16
	B4	0.07	96.92	3.01	0.00	3.04	122	68.86	-0.15	1.14
	B5	0.05	77.96	18.33	3.66	3.80	72	62.16	0.06	2.56
	B6	0.00	94.34	3.94	1.72	3.37	96	72.19	0.08	1.40
	B7	0.00	95.35	3.05	1.60	3.38	96	74.91	0.04	1.30
	B8	0.00	94.32	4.91	0.76	3.38	96	78.26	0.16	1.46
1994	B1	0.00	87.85	10.94	1.21	3.56	85	71.15	-0.02	1.24
	B2	0.00	73.87	24.59	1.54	3.46	91	51.93	0.19	1.11
	B3	0.03	98.40	1.57	0.00	2.88	136	67.87	-0.18	1.14
	B4	0.08	98.56	0.97	0.40	2.85	139	67.63	-0.13	1.10
	B5	0.00	75.92	22.78	1.29	3.81	71	70.98	0.11	1.43
	B6	0.00	94.48	5.52	0.00	3.25	105	72.36	-0.08	1.40
	B7	1.55	91.25	7.01	0.19	3.32	100	77.15	0.10	1.13
	B8	0.00	94.44	5.56	0.00	3.42	93	80.73	0.06	1.00
1993	B1	0.04	90.74	9.03	0.19	3.15	113	60.62	-0.34	1.46
	B2	0.00	84.13	15.06	0.82	3.52	87	66.77	0.15	1.38
	B3	0.00	96.87	2.97	0.16	3.18	110	72.2	-0.11	1.20
	B4	0.11	96.80	3.09	0.00	3.11	116	70.33	-0.2	1.26
	B5	0.00	66.83	31.88	1.30	3.83	70	63.22	-0.12	1.98
	B6	0.00	93.11	6.38	0.51	3,34	99	71.74	-0.06	1.33
	B7	0.00	92.17	7.50	0.33	3.51	88	77.88	0.19	1.22
	B8	0.00	94.78	4.71	0.50	3.41	94	83.03	0.05	0.98
1992	B1	6.06	92.51	1.41	0.03	1.94	260	54.96	-0.29	2.01
	B2	9.90	89.41	0.70	0.00	1.13	458	45.58	0.01	1.12
	B3	0.12	98.77	0.89	0.21	2.49	178	67.83	-0.22	1.07
	B4	0.29	98.79	0.89	0.03	2.50	177	71.25	-0.12	1.05
	B5	0.00	80.44	19.00	0.56	3.45	92	67.56	0.07	1.37
	B6	0.00	95.42	4.27	0.31	2.95	130	66.82	-0.04	1.92
	B7	0.10	92.32	7.22	0.36	3.29	102	72.43	0.34	1.59
	B8	0.00	96.24	3.58	0.18	3.11	116	73.15	0.13	1.11

Appendix D-1. (Cont.).

Year	Station	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean grain size phi	Mean grain size µm	Sorting	Skewness	Kurtosis
1991	B1	0.00	92.95	3.55	3.50	3.26	104	62.27	0.19	2.86
	B2	0.00	89.03	7.87	3.10	3.35	112	60.60	0.32	2.94
	B3	0.00	94.68	1.77	3.55	2.71	154	63.45	0.22	2.10
	B4	0.00	93.59	4.00	2.42	3.18	110	67.27	0.32	2.92
	B5	0.00	80.44	17.06	2.51	3.75	74	67.55	0.57	2.64
	B6	0.00	94.03	3.42	2.55	3.32	100	68.64	0.37	3.20
	B7	0.00	95.87	3.21	0.92	3.20	108	74.07	0.22	1.38
	B8	0.00	95.57	1.90	2.53	3.31	101	74.41	0.17	1.40
1990	B1	27.40	72.10	0.49	0.01	0.07	950	42.06	-0.43	0.92
	B2	0.00	97.91	1.86	0.23	2.32	200	61.52	0.12	0.81
	B3	0.00	98.08	1.90	0.02	2.30	203	65.61	0.15	0.83
	B4	0.18	98.11	1.71	0.01	2.42	188	64.62	-0.13	1.04
	B5	0.00	82.19	17.70	0.12	3.54	87	75.96	0.35	1.25
	B6	0.01	93.59	6.08	0.31	3.24	105	74.82	0.25	1.19
	B7	0.00	96.00	3.84	0.13	3.18	110	73.50	0.24	1.09
	B8	0.08	96.22	3.62	0.08	3.20	108	75.11	0.23	0.99

- = Not Sampled

APPENDIX E

Sediment chemistry by station

Del Mar Analytical

2852 Alton Ave., Irvine, CA 92606 (949) 261-1022 FAX (949) 261-1228
1014 E Coldby Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
7277 Hayvenhurst, Suite B-12, Van Nuys, CA 91406 (818) 779-1844 FAX (818) 779-1843
9484 Chesapeake Dr, Suite 805, San Diego, CA 92123 (858) 505-8596 FAX (858) 505-9589
9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851

MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: SGS01306C/ESGS01209A

Report Number: IKH0474

Sampled: 08/10/01
Received: 08/14/01

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/kg dry	mg/kg dry				
Sample ID: IKH0474-01 (B1 (I,II,III) - Soil)								
Chromium	EPA 6010B	1IH1627	1.8	**24**	1	8/16/01	8/17/01	
Copper	EPA 6010B	1IH1627	1.8	**6.0**	1	8/16/01	8/17/01	
Nickel	EPA 6010B	1IH1627	1.8	**12**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	1IH1627	8.8	**38**	1	8/16/01	8/17/01	
Sample ID: IKH0474-02 (B2 (I,II,III) - Soil)								
Chromium	EPA 6010B	1IH1627	1.8	**24**	1	8/16/01	8/17/01	
Copper	EPA 6010B	1IH1627	1.8	**8.8**	1	8/16/01	8/17/01	
Nickel	EPA 6010B	1IH1627	1.8	**13**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	1IH1627	8.9	**48**	1	8/16/01	8/17/01	
Sample ID: IKH0474-03 (B3 (I,II,III) - Soil)								
Chromium	EPA 6010B	1IH1627	1.6	**9.4**	1	8/16/01	8/17/01	
Copper	EPA 6010B	1IH1627	1.6	ND	1	8/16/01	8/17/01	
Nickel	EPA 6010B	1IH1627	1.6	**5.0**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	1IH1627	8.2	**12**	1	8/16/01	8/17/01	
Sample ID: IKH0474-04 (B4 (I,II,III) - Soil)								
Chromium	EPA 6010B	1IH1627	1.8	**13**	1	8/16/01	8/17/01	
Copper	EPA 6010B	1IH1627	1.8	**2.0**	1	8/16/01	8/17/01	
Nickel	EPA 6010B	1IH1627	1.8	**6.6**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	1IH1627	8.9	**17**	1	8/16/01	8/17/01	

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Appendix E. (Cont.).

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: SGS01306C/ESGS01209A

Report Number: IKH0474

Sampled: 08/10/01
Received: 08/14/01

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/kg dry	mg/kg dry				
Sample ID: IKH0474-05 (B5 (I,II,III) - Soil)								
Chromium	EPA 6010B	11H1627	1.8	**9.8**	1	8/16/01	8/17/01	
Copper	EPA 6010B	11H1627	1.8	**2.6**	1	8/16/01	8/17/01	
Nickel	EPA 6010B	11H1627	1.8	**3.1**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	11H1627	8.8	**17**	1	8/16/01	8/17/01	
Sample ID: IKH0474-06 (B6 (I,II,III) - Soil)								
Chromium	EPA 6010B	11H1627	1.9	**18**	1	8/16/01	8/17/01	
Copper	EPA 6010B	11H1627	1.9	**5.1**	1	8/16/01	8/17/01	
Nickel	EPA 6010B	11H1627	1.9	**9.0**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	11H1627	9.3	**23**	1	8/16/01	8/17/01	
Sample ID: IKH0474-07 (B7 (I,II,III) - Soil)								
Chromium	EPA 6010B	11H1627	1.8	**18**	1	8/16/01	8/17/01	
Copper	EPA 6010B	11H1627	1.8	**4.1**	1	8/16/01	8/17/01	
Nickel	EPA 6010B	11H1627	1.8	**8.8**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	11H1627	8.9	**21**	1	8/16/01	8/17/01	
Sample ID: IKH0474-08 (B8 (I,II,III) - Soil)								
Chromium	EPA 6010B	11H1627	1.6	**17**	1	8/16/01	8/17/01	
Copper	EPA 6010B	11H1627	1.6	**2.4**	1	8/16/01	8/17/01	
Nickel	EPA 6010B	11H1627	1.6	**8.0**	1	8/16/01	8/17/01	
Zinc	EPA 6010B	11H1627	8.1	**17**	1	8/16/01	8/17/01	

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Appendix E. (Cont.).

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: SGS01306C/ESGS01209A

Report Number: IKH0474

Sampled: 08/10/01
Received: 08/14/01

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			%	%				
Sample ID: IKH0474-01 (B1 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**57**	1	8/14/01	8/14/01	
Sample ID: IKH0474-02 (B2 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**56**	1	8/14/01	8/14/01	
Sample ID: IKH0474-03 (B3 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**61**	1	8/14/01	8/14/01	
Sample ID: IKH0474-04 (B4 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**56**	1	8/14/01	8/14/01	
Sample ID: IKH0474-05 (B5 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**57**	1	8/14/01	8/14/01	
Sample ID: IKH0474-06 (B6 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**54**	1	8/14/01	8/14/01	
Sample ID: IKH0474-07 (B7 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**56**	1	8/14/01	8/14/01	
Sample ID: IKH0474-08 (B8 (I,II,III) - Soil)								
Percent Solids	EPA 160.3 MOD	1H1456	0.010	**62**	1	8/14/01	8/14/01	

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MBC Applied Env. Sciences
3000 Redhill Avenue
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Attention: Mike Curtis

Project ID: SGS01306C/ESGS01209A

Report Number: IKH0474

Sampled: 08/10/01
Received: 08/14/01

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 11H1627 Extracted: 08/16/01										
Blank Analyzed: 08/16/01 (11H1627-BLK1)										
Chromium	ND	1.0	mg/kg wet							
Copper	ND	1.0	mg/kg wet							
Nickel	ND	1.0	mg/kg wet							
Zinc	ND	5.0	mg/kg wet							
LCS Analyzed: 08/16/01 (11H1627-BS1)										
Chromium	42.6	1.0	mg/kg wet	50.0		85.2	80-120			
Copper	43.3	1.0	mg/kg wet	50.0		86.6	80-120			
Nickel	42.4	1.0	mg/kg wet	50.0		84.8	80-120			
Zinc	41.2	5.0	mg/kg wet	50.0		82.4	80-120			
Matrix Spike Analyzed: 08/16/01 (11H1627-MS1)					**Source: IKH0501-02**					
Chromium	86.7	1.0	mg/kg wet	50.0	41	91.4	75-125			
Copper	178	1.0	mg/kg wet	50.0	250	-144	75-125			*M-HA*
Nickel	73.4	1.0	mg/kg wet	50.0	32	82.8	75-125			
Zinc	781	5.0	mg/kg wet	50.0	800	-38.0	75-125			*M-HA*
Matrix Spike Dup Analyzed: 08/16/01 (11H1627-MSD1)					**Source: IKH0501-02**					
Chromium	104	1.0	mg/kg wet	50.0	41	126	75-125	18.1	20	*M1*
Copper	190	1.0	mg/kg wet	50.0	250	-120	75-125	6.52	20	*M-HA*
Nickel	91.4	1.0	mg/kg wet	50.0	32	119	75-125	21.8	20	*R*
Zinc	952	5.0	mg/kg wet	50.0	800	304	75-125	19.7	20	*M-HA*

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: SGS01306C/ESGS01209A

Report Number: IKH0474

Sampled: 08/10/01
Received: 08/14/01

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: I1H1456 Extracted: 08/14/01										
Blank Analyzed: 08/14/01 (I1H1456-BLK1)										
Percent Solids	ND	0.010	%							
Duplicate Analyzed: 08/14/01 (I1H1456-DUP1)					**Source: IKH0294-01**					
Percent Solids	21.6	0.010	%		22			1.83	20	

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MBC Applied Env. Sciences
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Attention: Mike Curtis

Project ID: SGS01306C/ESGS01209A

Report Number: IKH0474

Sampled: 08/10/01
Received: 08/14/01

DATA QUALIFIERS AND DEFINITIONS

M-HA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).
M1	The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
R	The RPD exceeded the method control limit due to sample matrix effects. The individual analyte QA/QC recoveries, however, were within acceptance limits.
ND	Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.
NR	Not reported.
RPD	Relative Percent Difference

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Appendix E-1. Yearly sediment metal concentrations, 1990 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Metal	Station	1990	1991	1992	1993	1994	1997	1998	1999	2000	2001	Mean
Chromium	B1	4.5	11.0	15.0	14.0	15.0	13.0	NS	15.0	16	24	14.2
ERL = 81	B2	7.7	6.8	8.2	16.0	18.0	15.0	20.0	22.0	10	24	14.8
	B3	9.1	8.2	15.0	14.0	12.0	12.0	8.5	12.0	12	9.4	11.2
	B4	12.3	13.0	14.0	14.0	11.0	13.0	NS	16.0	18	13	13.8
	B5	43.3	22.0	20.0	20.0	18.0	20.0	NS	6.8	20	9.8	20.0
	B6	13.3	14.0	16.0	13.0	15.0	14.0	14.0	17.0	16	18	15.0
	B7	12.8	13.0	20.0	16.0	19.0	16.0	15.0	18.0	20	18	16.8
	B8	13.9	14.0	17.0	14.0	13.0	15.0	NS	16.0	17	17	15.2
Copper	B1	1.3	3.2	4.2	5.2	5.4	5.7	NS	4.3	3.4	6.0	4.3
ERL = 34	B2	1.7	2.2	2.6	6.3	7.9	6.5	8.5	7.0	2.3	8.8	5.4
	B3	1.9	2.6	3.3	3.4	3.2	4.2	2.8	2.4	1.8	ND	2.6
	B4	2.0	2.8	2.9	3.4	2.5	4.2	NS	2.4	4.8	2.0	3.0
	B5	8.5	7.2	5.5	7.8	5.8	7.1	NS	1.8	5.5	2.6	5.8
	B6	4.2	5.1	5.1	5.9	4.9	5.8	4.7	4.7	5.4	5.1	5.1
	B7	3.1	3.9	4.4	4.9	5.1	5.2	3.9	4.1	4.3	4.1	4.3
	B8	2.6	3.4	3.5	3.0	3.2	3.9	NS	2.3	3.5	2.4	3.1
Nickel	B1	1.9	5.9	7.1	7.7	7.7	10.0	NS	8.2	7.4	12	7.5
ERL = 21	B2	3.3	4.2	4.0	8.9	10.0	11.0	7.5	11.0	5.8	13	7.9
	B3	4.3	4.8	6.7	7.3	6.4	9.4	3.5	5.3	6.4	5.0	5.9
	B4	5.8	6.5	6.4	7.7	5.7	9.6	NS	6.5	8.4	6.6	7.0
	B5	18.3	9.7	8.9	9.0	8.1	13.0	NS	1.9	9.7	3.1	9.1
	B6	6.9	7.1	6.8	7.0	7.1	9.5	5.4	7.3	7.7	9.0	7.4
	B7	6.3	6.8	8.0	7.9	7.5	10.0	2.5	7.5	8.2	8.8	7.3
	B8	6.5	5.6	7.4	6.8	6.7	10.0	NS	7.2	8.3	8.0	7.4
Zinc	B1	9.1	20.0	25.0	28.0	26.0	25.0	NS	31.0	21	38	24.8
ERL = 150	B2	12.4	11.0	12.0	34.0	37.0	29.0	42.0	43.0	18	48	28.6
	B3	12.5	15.0	17.0	22.0	17.0	18.0	15.0	19.0	15	12	16.3
	B4	1.8	19.0	17.0	21.0	16.0	19.0	NS	18.0	26	17	17.2
	B5	40.0	35.0	30.0	35.0	31.0	33.0	NS	15.0	32	17	29.8
	B6	20.3	22.0	22.0	22.0	23.0	21.0	22.0	24.0	28	23	22.7
	B7	18.8	19.0	23.0	21.0	21.0	21.0	18.0	23.0	22	21	20.8
	B8	18.8	20.0	20.0	17.0	17.0	19.0	NS	20.0	21	17	18.9
Fines	B1	0.5	7.1	1.4	9.2	12.2	8.9	NS	11.22	1.9	25.0	8.6
	B2	2.1	11.0	0.7	15.9	26.1	19.4	18.3	15.63	5.4	38.6	15.3
	B3	2.0	5.3	1.1	3.1	1.6	1.0	0.0	2.18	2.8	1.8	2.1
	B4	1.7	6.4	0.9	3.1	1.4	3.0	NS	4.28	3.1	4.0	3.1
	B5	17.8	19.6	19.6	33.2	24.1	22.0	NS	0.7	20.9	1.7	17.7
	B6	6.4	6.0	4.6	6.9	5.5	5.7	5.9	7.24	8.5	7.3	6.4
	B7	4.0	4.1	7.6	7.8	7.2	4.7	5.0	6.1	7.0	4.4	5.8
	B8	3.7	4.4	3.8	5.2	5.6	5.7	NS	5.8	7.1	4.6	5.1

Year columns (1990–2001) are grouped under the heading YEAR.

NS = not sampled

ND = below the detection limit (for calculations ND = 0)

ERL = Effects Range Low

APPENDIX F

Mussel tissue chemistry by station

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MBC Applied Env. Sciences
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Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS

Report Number: IKJ0128

Sampled: 08/10/01
Received: 10/03/01

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/kg dry	mg/kg dry				
Sample ID: IKJ0128-01 (ES1 MT-I - Solid)								
Chromium	EPA 6010B	1IJ1041	5.0	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	1IJ1041	5.0	ND	1	10/10/01	10/11/01	
Nickel	EPA 6010B	1IJ1041	5.0	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	1IJ1041	25	**70**	1	10/10/01	10/11/01	
Sample ID: IKJ0128-02 (ES1 MT-II - Solid)								
Chromium	EPA 6010B	1IJ1041	4.8	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	1IJ1041	4.8	ND	1	10/10/01	10/11/01	
Nickel	EPA 6010B	1IJ1041	4.8	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	1IJ1041	24	**54**	1	10/10/01	10/11/01	
Sample ID: IKJ0128-03 (ES1 MT-III - Solid)								
Chromium	EPA 6010B	1IJ1041	3.7	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	1IJ1041	3.7	**3.9**	1	10/10/01	10/11/01	
Nickel	EPA 6010B	1IJ1041	3.7	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	1IJ1041	18	**47**	1	10/10/01	10/11/01	
Sample ID: IKJ0128-04 (ES3 MT-I - Solid)								
Chromium	EPA 6010B	1IJ1041	4.9	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	1IJ1041	4.9	**7.7**	1	10/10/01	10/11/01	
Nickel	EPA 6010B	1IJ1041	4.9	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	1IJ1041	24	**78**	1	10/10/01	10/11/01	

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9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785

MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS

Report Number: IKJ0128

Sampled: 08/10/01
Received: 10/03/01

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/kg dry	mg/kg dry				
Sample ID: IKJ0128-05 (ES3 MT-II - Solid)								
Chromium	EPA 6010B	11J1041	4.6	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	11J1041	4.6	**8.2**	1	10/10/01	10/11/01	
Nickel	EPA 6010B	11J1041	4.6	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	11J1041	23	**75**	1	10/10/01	10/11/01	
Sample ID: IKJ0128-06 (ES3 MT-III - Solid)								
Chromium	EPA 6010B	11J1041	4.5	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	11J1041	4.5	**5.7**	1	10/10/01	10/11/01	
Nickel	EPA 6010B	11J1041	4.5	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	11J1041	23	**84**	1	10/10/01	10/11/01	
Sample ID: IKJ0128-07 (SG MT-I - Solid)								
Chromium	EPA 6010B	11J1041	5.3	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	11J1041	5.3	**87**	1	10/10/01	10/11/01	
Nickel	EPA 6010B	11J1041	5.3	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	11J1041	26	**65**	1	10/10/01	10/11/01	
Sample ID: IKJ0128-08 (SG MT-II - Solid)								
Chromium	EPA 6010B	11J1041	5.8	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	11J1041	5.8	**9.6**	1	10/10/01	10/11/01	
Nickel	EPA 6010B	11J1041	5.8	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	11J1041	29	**46**	1	10/10/01	10/11/01	

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Appendix F. (Cont.).

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9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851

MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS

Report Number: IKJ0128

Sampled: 08/10/01
Received: 10/03/01

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/kg dry	mg/kg dry				
Sample ID: IKJ0128-09 (SG MT-III - Solid)								
Chromium	EPA 6010B	1IJ1041	4.7	ND	1	10/10/01	10/11/01	
Copper	EPA 6010B	1IJ1041	4.7	**11**	1	10/10/01	10/11/01	
Nickel	EPA 6010B	1IJ1041	4.7	ND	1	10/10/01	10/11/01	
Zinc	EPA 6010B	1IJ1041	24	**43**	1	10/10/01	10/11/01	

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9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 78

MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS

Report Number: IKJ0128

Sampled: 08/10/01
Received: 10/03/01

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifier
			%	%				
Sample ID: IKJ0128-01 (ES1 MT-I - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**20**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0128-02 (ES1 MT-II - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**21**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0128-03 (ES1 MT-III - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**27**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0128-04 (ES3 MT-I - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**21**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0128-05 (ES3 MT-II - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**22**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0128-06 (ES3 MT-III - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**22**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0128-07 (SG MT-I - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**19**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0128-08 (SG MT-II - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**17**	1	10/5/01	10/5/01	H3

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MBC Applied Env. Sciences
3000 Redhill Avenue
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Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS

Report Number: IKJ0128

Sampled: 08/10/01
Received: 10/03/01

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			%	%				
Sample ID: IKJ0128-09 (SG MT-III - Solid)								
Percent Solids	EPA 160.3 MOD	I1J0550	0.010	**21**	1	10/5/01	10/5/01	H3

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS
Report Number: IKJ0128
Sampled: 08/10/01
Received: 10/03/01

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: I1J1041 Extracted: 10/10/01										
Blank Analyzed: 10/10/01 (I1J1041-BLK1)										
Chromium	ND	1.0	mg/kg wet							
Copper	ND	1.0	mg/kg wet							
Nickel	ND	1.0	mg/kg wet							
Zinc	ND	5.0	mg/kg wet							
LCS Analyzed: 10/11/01 (I1J1041-BS1)										
Chromium	51.5	1.0	mg/kg wet	50.0		103	80-120			
Copper	50.2	1.0	mg/kg wet	50.0		100	80-120			
Nickel	50.4	1.0	mg/kg wet	50.0		101	80-120			
Zinc	50.5	5.0	mg/kg wet	50.0		101	80-120			
Matrix Spike Analyzed: 10/10/01 (I1J1041-MS1)					**Source: IKJ0174-01**					
Chromium	59.4	1.0	mg/kg wet	50.0	9.2	100	75-125			
Copper	62.7	1.0	mg/kg wet	50.0	13	99.4	75-125			
Nickel	55.0	1.0	mg/kg wet	50.0	7.0	96.0	75-125			
Zinc	99.6	5.0	mg/kg wet	50.0	47	105	75-125			
Matrix Spike Dup Analyzed: 10/10/01 (I1J1041-MSD1)					**Source: IKJ0174-01**					
Chromium	45.0	1.0	mg/kg wet	50.0	9.2	71.6	75-125	27.6	20	*M2,R-3*
Copper	45.5	1.0	mg/kg wet	50.0	13	65.0	75-125	31.8	20	*M2,R-3*
Nickel	41.0	1.0	mg/kg wet	50.0	7.0	68.0	75-125	29.2	20	*M2,R-3*
Zinc	72.3	5.0	mg/kg wet	50.0	47	50.6	75-125	31.8	20	*M2,R-3*

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS
Report Number: IKJ0128

Sampled: 08/10/01
Received: 10/03/01

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: I1J0550 Extracted: 10/05/01										
Blank Analyzed: 10/05/01 (I1J0550-BLK1)										
Percent Solids	ND	0.010	%							
Duplicate Analyzed: 10/05/01 (I1J0550-DUP1)					**Source: IKJ0128-01**					
Percent Solids	19.6	0.010	%		20			2.02	20	

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MBC Applied Env. Sciences
3000 Redhill Avenue
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Attention: Mike Curtis

Project ID: 01306C/01209A - LADWP SGS/NRG ESGS

Report Number: IKJ0128

Sampled: 08/10/01
Received: 10/03/01

DATA QUALIFIERS AND DEFINITIONS

H3	Sample was received and analyzed past holding time.
M2	The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
R-3	The RPD exceeded the method control limit due to sample matrix effects.
ND	Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.
NR	Not reported.
RPD	Relative Percent Difference

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01204A Catalina NPDES

Report Number: IKJ1098

Sampled: 10/19/01
Received: 10/26/01

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/kg dry	mg/kg dry				
Sample ID: IKJ1098-04 (MT-MNC I - Solid)								
Chromium	EPA 6010B	11J3081	7.9	ND	1	10/30/01	10/31/01	
Copper	EPA 6010B	11J3081	7.9	**13**	1	10/30/01	10/31/01	
Nickel	EPA 6010B	11J3081	7.9	ND	1	10/30/01	10/31/01	
Zinc	EPA 6010B	11J3081	40	**270**	1	10/30/01	10/31/01	
Sample ID: IKJ1098-05 (MT-MNC II - Solid)								
Chromium	EPA 6010B	11J3140	7.4	ND	1	10/31/01	11/2/01	
Copper	EPA 6010B	11J3140	7.4	**16**	1	10/31/01	11/2/01	
Nickel	EPA 6010B	11J3140	7.4	ND	1	10/31/01	11/2/01	
Zinc	EPA 6010B	11J3140	37	**170**	1	10/31/01	11/2/01	
Sample ID: IKJ1098-06 (MT-MNC III - Solid)								
Chromium	EPA 6010B	11J3140	9.5	ND	1	10/31/01	11/2/01	
Copper	EPA 6010B	11J3140	9.5	**16**	1	10/31/01	11/2/01	
Nickel	EPA 6010B	11J3140	9.5	ND	1	10/31/01	11/2/01	
Zinc	EPA 6010B	11J3140	47	**250**	1	10/31/01	11/2/01	

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01204A Catalina NPDES

Report Number: IKJ1098

Sampled: 10/19/01
Received: 10/26/01

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifie
			%	%				
Sample ID: IKJ1098-04 (MT-MNC I - Solid)								
Percent Solids	EPA 160.3 MOD	I1J2975	0.010	**13**	1	10/29/01	10/29/01	
Sample ID: IKJ1098-05 (MT-MNC II - Solid)								
Percent Solids	EPA 160.3 MOD	I1J2975	0.010	**14**	1	10/29/01	10/29/01	
Sample ID: IKJ1098-06 (MT-MNC III - Solid)								
Percent Solids	EPA 160.3 MOD	I1J2975	0.010	**11**	1	10/29/01	10/29/01	

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MBC Applied Env. Sciences
3000 Redhill Avenue
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Attention: Mike Curtis

Project ID: 01204A Catalina NPDES

Report Number: IKJ1098

Sampled: 10/19/01
Received: 10/26/01

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 11J3081 Extracted: 10/30/01										
Blank Analyzed: 11/01/01 (11J3081-BLK1)										
Chromium	ND	1.0	mg/kg wet							
Copper	ND	1.0	mg/kg wet							
Nickel	ND	1.0	mg/kg wet							
Zinc	ND	5.0	mg/kg wet							
LCS Analyzed: 10/31/01 (11J3081-BS1)										
Chromium	49.8	1.0	mg/kg wet	50.0		100	80-120			
Copper	46.3	1.0	mg/kg wet	50.0		93	80-120			
Nickel	48.2	1.0	mg/kg wet	50.0		96	80-120			
Zinc	48.2	5.0	mg/kg wet	50.0		96	80-120			
Matrix Spike Analyzed: 10/31/01 (11J3081-MS1)					**Source: IKJ1142-21**					
Chromium	55.3	1.0	mg/kg wet	50.0	9.1	92	75-125			
Copper	51.4	1.0	mg/kg wet	50.0	4.1	95	75-125			
Nickel	54.1	1.0	mg/kg wet	50.0	7.0	94	75-125			
Zinc	64.4	5.0	mg/kg wet	50.0	17	95	75-125			
Matrix Spike Dup Analyzed: 10/31/01 (11J3081-MSD1)					**Source: IKJ1142-21**					
Chromium	55.2	1.0	mg/kg wet	50.0	9.1	92	75-125	0	20	
Copper	50.6	1.0	mg/kg wet	50.0	4.1	93	75-125	2	20	
Nickel	52.7	1.0	mg/kg wet	50.0	7.0	91	75-125	3	20	
Zinc	63.5	5.0	mg/kg wet	50.0	17	93	75-125	1	20	
Batch: 11J3140 Extracted: 10/31/01										
Blank Analyzed: 11/02/01 (11J3140-BLK1)										
Chromium	ND	1.0	mg/kg wet							
Copper	ND	1.0	mg/kg wet							
Nickel	ND	1.0	mg/kg wet							
Zinc	ND	5.0	mg/kg wet							

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Attention: Mike Curtis

Project ID: 01204A Catalina NPDES

Report Number: IKJ1098

Sampled: 10/19/01
Received: 10/26/01

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: I1J3140 Extracted: 10/31/01										
LCS Analyzed: 11/02/01 (I1J3140-BS1)										
Chromium	51.8	1.0	mg/kg wet	50.0		104	80-120			
Copper	49.5	1.0	mg/kg wet	50.0		99	80-120			
Nickel	49.8	1.0	mg/kg wet	50.0		100	80-120			
Zinc	49.3	5.0	mg/kg wet	50.0		99	80-120			
Matrix Spike Analyzed: 11/03/01 (I1J3140-MS1)					**Source: IKJ1156-01**					
Chromium	56.3	1.0	mg/kg wet	50.0	18	77	75-125			
Copper	60.0	1.0	mg/kg wet	50.0	21	78	75-125			
Nickel	50.6	1.0	mg/kg wet	50.0	13	75	75-125			
Zinc	104	5.0	mg/kg wet	50.0	68	72	75-125			*M2*
Matrix Spike Dup Analyzed: 11/03/01 (I1J3140-MSD1)					**Source: IKJ1156-01**					
Chromium	54.9	1.0	mg/kg wet	50.0	18	74	75-125	3	20	*M2*
Copper	58.4	1.0	mg/kg wet	50.0	21	75	75-125	3	20	
Nickel	49.6	1.0	mg/kg wet	50.0	13	73	75-125	2	20	*M2*
Zinc	101	5.0	mg/kg wet	50.0	68	66	75-125	3	20	*M2*

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MBC Applied Env. Sciences
3000 Redhill Avenue
Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01204A Catalina NPDES

Report Number: IKJ1098

Sampled: 10/19/01
Received: 10/26/01

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: I1J2975 Extracted: 10/29/01										
Blank Analyzed: 10/29/01 (I1J2975-BLK1)										
Percent Solids	ND	0.010	%							
Duplicate Analyzed: 10/29/01 (I1J2975-DUP1)					**Source: IKJ0978-01RE1**					
Percent Solids	12.4	0.010	%		12			3	20	

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3000 Redhill Avenue
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Attention: Mike Curtis

Project ID: 01204A Catalina NPDES

Report Number: IKJ1098

Sampled: 10/19/01
Received: 10/26/01

DATA QUALIFIERS AND DEFINITIONS

M2 The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).

ND Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.

NR Not reported.

RPD Relative Percent Difference

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Appendix F. (Cont.).

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MBC Applied Env. Sciences
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Costa Mesa, CA 92626-4524
Attention: Mike Curtis

Project ID: 01214A Manhattan Pier NPDES

Report Number: IKJ0192

Sampled: 08/10/01
Received: 10/04/01

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/kg dry	mg/kg dry				
Sample ID: IKJ0192-04 (MT MP-I - Soil)								
Chromium	EPA 6010B	1IJ0951	5.2	ND	1	10/9/01	10/10/01	
Copper	EPA 6010B	1IJ0951	5.2	ND	1	10/9/01	10/10/01	L2
Nickel	EPA 6010B	1IJ0951	5.2	ND	1	10/9/01	10/10/01	
Zinc	EPA 6010B	1IJ0951	26	**45**	1	10/9/01	10/10/01	
Sample ID: IKJ0192-05 (MT MP-II - Soil)								
Chromium	EPA 6010B	1IJ0951	4.7	ND	1	10/9/01	10/10/01	
Copper	EPA 6010B	1IJ0951	4.7	**5.3**	1	10/9/01	10/10/01	L2
Nickel	EPA 6010B	1IJ0951	4.7	ND	1	10/9/01	10/10/01	
Zinc	EPA 6010B	1IJ0951	23	**68**	1	10/9/01	10/10/01	
Sample ID: IKJ0192-06 (MT MP-III - Soil)								
Chromium	EPA 6010B	1IJ0951	4.5	ND	1	10/9/01	10/10/01	
Copper	EPA 6010B	1IJ0951	4.5	**5.7**	1	10/9/01	10/10/01	L2
Nickel	EPA 6010B	1IJ0951	4.5	ND	1	10/9/01	10/10/01	
Zinc	EPA 6010B	1IJ0951	23	**48**	1	10/9/01	10/10/01	

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Sampled: 08/10/01
Received: 10/04/01

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifie
			%	%				
Sample ID: IKJ0192-04 (MT MP-I - Soil)								
Percent Solids	EPA 160.3 MOD	11J0550	0.010	**19**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0192-05 (MT MP-II - Soil)								
Percent Solids	EPA 160.3 MOD	11J0550	0.010	**21**	1	10/5/01	10/5/01	H3
Sample ID: IKJ0192-06 (MT MP-III - Soil)								
Percent Solids	EPA 160.3 MOD	11J0550	0.010	**22**	1	10/5/01	10/5/01	H3

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Appendix F. (Cont.).

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Attention: Mike Curtis

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Report Number: IKJ0192

Sampled: 08/10/01
Received: 10/04/01

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: I1J0951 Extracted: 10/09/01										
Blank Analyzed: 10/10/01 (I1J0951-BLK1)										
Chromium	ND	1.0	mg/kg wet							
Copper	ND	1.0	mg/kg wet							
Nickel	ND	1.0	mg/kg wet							
Zinc	ND	5.0	mg/kg wet							
LCS Analyzed: 10/10/01 (I1J0951-BS1)										
Chromium	42.4	1.0	mg/kg wet	50.0		85	80-120			
Copper	39.7	1.0	mg/kg wet	50.0		79	80-120			*L2*
Nickel	41.4	1.0	mg/kg wet	50.0		83	80-120			
Zinc	40.6	5.0	mg/kg wet	50.0		81	80-120			
Matrix Spike Analyzed: 10/10/01 (I1J0951-MS1)					**Source: IKJ0257-02**					
Chromium	48.7	1.0	mg/kg wet	50.0	9.0	79	75-125			
Copper	46.6	1.0	mg/kg wet	50.0	6.5	80	75-125			*L2*
Nickel	45.8	1.0	mg/kg wet	50.0	6.4	79	75-125			
Zinc	64.8	5.0	mg/kg wet	50.0	29	72	75-125			*M2*
Matrix Spike Dup Analyzed: 10/10/01 (I1J0951-MSD1)					**Source: IKJ0257-02**					
Chromium	52.8	1.0	mg/kg wet	50.0	9.0	88	75-125	8	20	
Copper	51.0	1.0	mg/kg wet	50.0	6.5	89	75-125	9	20	*L2*
Nickel	49.7	1.0	mg/kg wet	50.0	6.4	87	75-125	8	20	
Zinc	69.9	5.0	mg/kg wet	50.0	29	82	75-125	8	20	

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifie
Batch: I1J0550 Extracted: 10/05/01										
Blank Analyzed: 10/05/01 (I1J0550-BLK1)										
Percent Solids	ND	0.010	%							
Duplicate Analyzed: 10/05/01 (I1J0550-DUP1)					**Source: IKJ0128-01**					
Percent Solids	19.6	0.010	%		20			2	20	

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Report Number: IKJ0192

Sampled: 08/10/01
Received: 10/04/01

DATA QUALIFIERS AND DEFINITIONS

H3 Sample was received and analyzed past holding time.

L2 Laboratory Control Sample recovery was below method control limits. See Corrective Action Report.

M2 The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).

ND Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.

NR Not reported.

RPD Relative Percent Difference

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Appendix F-1. Yearly bay mussel tissue metal concentrations (mg/dry kg). El Segundo and Scattergood Generating Stations NPDES, 2001.

	Chromium (ERL = 81)					Copper (ERL = 34)					Nickel (ERL = 21)					Zinc (ERL = 150)				
	Rep 1	Rep 2	Rep 3	Mean	S.D.	Rep 1	Rep 2	Rep 3	Mean	S.D.	Rep 1	Rep 2	Rep 3	Mean	S.D.	Rep 1	Rep 2	Rep 3	Mean	S.D.
El Segundo																				
1990	4.1	4.3	5.1	4.5	0.5	5.6	7.3	8.0	7.0	1.2	<3.0	<3.0	3.3	<3.1	0.2	100	120	120	113.3	11.5
1991*	ND	ND	ND	-	-				14.0	-	ND	ND	ND	-	-				190.0	-
1992**	ND	ND	ND	-	-				2.5	-	ND	ND	ND	-	-				71.0	-
1993	ND	ND	ND	-	-	4.3	4.6	5.0	4.6	0.4	ND	ND	ND	-	-	57	54	70	60.3	8.5
1999	ND	ND	ND	-	-	18.0	14.0	41.0	24.3	14.6	ND	ND	ND	-	-	100	120	140	120.0	20.0
2000	ND	ND	ND	-	-	8.5	15.0	9.9	11.1	3.4	ND	ND	ND	-	-	82	71	94	82.3	11.5
2001																				
Units 1 & 2	ND	ND	ND	-	-	ND	ND	3.9	1.3	-	ND	ND	ND	-	-	70	54	47	57	11.8
Units 3 & 4	ND	ND	ND	-	-	7.7	8.2	5.7	7.2	1.3	ND	ND	ND	-	-	78	75	84	79	4.6
Scattergood																				
1990	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-
1991	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-
1992	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-
1993	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-	NS	NS	NS	-	-
1994	ND	ND	ND	-	-	7.2	7.2	7.3	7.2	0.1	ND	ND	ND	-	-	83	81	78	80.7	2.5
1999	ND	ND	ND	-	-	8.5	ND	ND	2.8	-	ND	ND	ND	-	-	130	110	100	113.3	15.3
2000	ND	ND	ND	-	-	6.7	7.7	8.6	7.7	1.0	ND	ND	ND	-	-	78	79	100	85.7	12.4
2001	ND	ND	ND	-	-	8.7***	9.6	11	9.8	1.2	ND	ND	ND	-	-	65	46	43	51.3	11.9

ND = Below the detection limit (for calculations ND = 0)
NS = Not Sampled
* Only one rep collected
** Only mean reported
***Anomalously reported as 87
ERL = Effects Range Low

APPENDIX G

Infauna data by station

Appendix G-1. Infaunal master species list. El Segundo and Scattergood Generating Stations NPDES, 2001.

PHYLUM
Subphylum or Class
Species

CNIDARIA
- Anthozoa
  - Actiniaria
  - *Edwardsia* sp G MEC 1992[1]
  - Limnactiniidae sp A SCAMIT 1989
  - Pennatulacea
  - *Scolanthus* sp A SCAMIT 1983

PLATYHELMINTHES
- Turbellaria
  - *Plehnia caeca*
  - *Stylochoplana* sp[2]

NEMERTEA
- Anopla
  - *Carinoma mutabilis*
  - Lineidae
  - *Micrura* sp
  - *Tubulanus polymorphus*[3]
- Enopla
  - *Paranemertes californica*[4]
  - *Tetrastemma* sp A SCAMIT 1995
- Uncertain
  - Nemertea

NEMATODA
  - Nematoda

MOLLUSCA
- Bivalvia
  - Bivalvia
  - *Cooperella subdiaphana*
  - *Ennucula tenuis*
  - *Ensis myrae*
  - *Leporimetis obesa*
  - *Leptopecten latiauratus*
  - *Macoma indentata*
  - *Macoma nasuta*
  - *Macoma secta*
  - *Macoma* sp
  - *Macoma yoldiformis*
  - *Mactromeris catilliformis*
  - *Mytilus galloprovincialis*
  - *Periploma discus*
  - *Protothaca staminea*
  - *Rochefortia grippi*[5]
  - *Rochefortia tumida*[6]
  - *Solamen columbianum*
  - *Tellina bodegensis*
  - *Tellina modesta*
  - *Yoldia cooperi*
- Gastropoda
  - *Acteocina culcitella*
  - *Acteocina harpa*
  - *Caecum crebricinctum*
  - *Crepidula norrisiarum*[7]
  - *Epitonium sawinae*[8]
  - *Halistylus pupoideus*
  - *Kurtziella plumbea*
  - *Nassarius perpinguis*
  - *Neverita reclusiana*
  - *Olivella baetica*
  - *Rictaxis punctocaelatus*
  - *Turbonilla almo*
  - *Turbonilla santarosana*[9]

SIPUNCULA
- Sipunculidea
  - *Siphonosoma ingens*

ANNELIDA
- Oligochaeta
  - Oligochaeta
- Polychaeta
  - *Ampharete labrops*
  - *Aonides* sp
  - *Aphelochaeta glandaria*[10]
  - *Apoprionospio pygmaea*[11]

ANNELIDA (Cont.).
- Polychaeta
  - *Aricidea (Acmira) catherinae*[12]
  - *Armandia brevis*
  - *Capitella capitata* Cmplx
  - *Caulleriella alata*
  - *Chaetozone corona*
  - *Chaetozone setosa* Cmplx[13]
  - *Chone mollis*
  - *Chone* sp SD 1 Pt. Loma 1997
  - *Cirriformia moorei*
  - *Diopatra ornata*
  - *Dipolydora socialis*[14]
  - *Eranno lagunae*
  - *Eteone californica*
  - *Eteone fauchaldi*
  - *Euchone arenae*
  - Euclymeninae sp A SCAMIT 1987
  - *Eusyllis transecta*
  - *Glycera macrobranchia*[15]
  - *Glycera nana*[16]
  - *Goniada littorea*
  - *Goniada maculata*
  - *Hesionella mccullochae*
  - *Hesionura coineaui difficilis*
  - *Leitoscoloplos pugettensis*[17]
  - *Lumbrineris japonica*
  - *Magelona hartmanae*
  - *Magelona pitelkai*
  - *Magelona sacculata*
  - Maldanidae
  - *Mediomastus acutus*
  - *Mediomastus* spp[18]
  - *Micropodarke dubia*
  - *Monticellina cryptica*[19]
  - *Nephtys caecoides*
  - *Nephtys californiensis*
  - *Nephtys cornuta*[20]
  - *Nereiphylla castanea*
  - *Nereis latescens*
  - *Onuphis eremita parva*
  - *Onuphis* sp 1 Pt. Loma 1983
  - *Owenia collaris*[21]
  - *Paranaitis polynoides*
  - *Parandalia fauveli*
  - *Paraprionospio pinnata*
  - *Pectinaria californiensis*[22]
  - *Pherusa neopapillata*
  - *Phyllodoce hartmanae*
  - *Phyllodoce longipes*
  - *Phyllodoce* sp
  - *Podarkeopsis glabra*[23]
  - *Poecilochaetus johnsoni*
  - *Polycirrus* sp
  - *Polydora bioccipitalis*
  - *Polydora cornuta*
  - *Polydora* sp
  - *Prionospio (Minuspio) lighti*[24]
  - *Prionospio jubata*[25]
  - *Proceraea* sp
  - *Protodorvillea gracilis*
  - *Scoloplos acmeceps*
  - *Scoloplos armiger* Cmplx[26]
  - *Sigalion spinosus*[27]
  - *Spiochaetopterus costarum*
  - *Spiophanes berkeleyorum*
  - *Spiophanes bombyx*
  - *Spiophanes duplex*[28]
  - *Sthenelais verruculosa*
  - *Syllis (Typosyllis) farallonensis*
  - *Tenonia priops*

ARTHROPODA
- Copepoda
  - Harpacticoida
- Malacostraca
  - *Americhelidium rectipalmum*[29]
  - *Americhelidium shoemakeri*[30]

Appendix G-1. (Cont.).

PHYLUM
Subphylum or Class
Species

ARTHROPODA (Cont.).
- Malacostraca
  - *Acuminodeutopus heteruropus*
  - *Ampelisca agassizi*
  - *Ampelisca brachycladus*
  - *Ampelisca cristata cristata*
  - *Amphideutopus oculatus*
  - *Anchicolurus occidentalis*
  - *Ancinus granulatus*
  - *Aoroides inermis*
  - *Argissa hamatipes*
  - *Campylaspis* sp C Myers & Benedict 1974[31]
  - *Cancer* sp
  - *Cumella californica*[32]
  - *Diastylopsis tenuis*
  - *Edotia sublittoralis*[33]
  - *Elasmopus holgurus*
  - *Ericthonius brasiliensis*
  - *Foxiphalus obtusidens*
  - *Gibberosus devaneyi*
  - *Gibberosus myersi*[34]
  - *Hartmanodes hartmanae*[35]
  - *Hemilamprops californica*
  - *Hornellia occidentalis*[36]
  - *Jassa slatteryi*[37]
  - Janiridae
  - *Isocheles pilosus*
  - *Lamprops quadriplicatus*
  - *Lepidopa californica*
  - *Leptocuma forsmani*
  - *Mandibulophoxus gilesi*
  - *Melphisana bola* Cmplx
  - *Metatiron tropakis*
  - *Metharpinia coronadoi*
  - *Mysidopsis intii*
  - *Monocorophium* sp
  - *Nebalia daytoni*[38]
  - *Neomysis kadiakensis*
  - *Neotrypaea californiensis*[39]
  - Oedicerotidae
  - Oxyurostylis pacifica
  - *Pachynus barnardi*
  - *Paguristes* sp
  - *Paramicrodeutopus schmitti*
  - *Photis brevipes*

ARTHROPODA (Cont.).
  - *Photis macinerneyi*
  - *Photis* sp OC1 Diener 1992[40]
  - *Pinnixa longipes*
  - *Pleusymtes subglaber*
  - *Rhepoxynius abronius*
  - *Rhepoxynius menziesi*[41]
  - *Rudilemboides stenopropodus*
  - Sphaeromatidae
  - *Stenothoe estacola*
  - *Uromunna ubiquita*[42]
- Ostracoda
  - *Euphilomedes carcharodonta*
  - *Leuroleberis sharpei*
  - *Parasterope hulingsi*
  - *Zeugophilomedes oblongatus*
- Pycnogonida
  - *Ammothea hilgendorfi*

ECHINODERMATA
- Asteroidea
  - *Astropecten verrilli*
- Echinoidea
  - *Dendraster excentricus*
- Ophiuroidea
  - *Amphiodia digitata*
  - Amphiuridae
- Holothuroidea
  - *Leptosynapta* sp[43]

PHORONA
  - Phorona
  - *Phoronis* sp

BRACHIOPODA
- Inarticulata
  - *Glottidia albida*

CHORDATA
- Hemichordata
  - Enteropneusta[44]
- Cephalochordata
  - *Branchiostoma californiense*
- Urochordata
  - Ascidiacea

SCAMIT = Southern California Association of Marine Invertebrate Taxonomists

The following footnotes indicate names used in previous surveys:

1 *Edwardsia* sp G of MEC, of Ljubenkov
2 Platyhelminthes sp D of MBC
3 *Tubulanus* sp or *T. pellucidus/polymorphus*
4 *Paranemertes* sp A SCAMIT
5 *Mysella* sp A of SCAMIT
6 *Mysella tumida*
7 *Crepidula excavata*
8 *Nitidiscala sawinae*
9 *Turbonilla* sp E of MBC
10 *Aphelochaeta* sp C Dorsey, *Tharyx* sp C SCAMIT, or *Tharyx* spp (in part)
11 *Apoprionospio pygmaeus* or *Prionospio pygmaeus*
12 *Acmira catherinae* or *Acesta catherinae*
13 *Chaetozone "setosa"*, *C.* cf. *Setosa*, or *C. setosa*
14 *Polydora socialis*
15 *Glycera covoluta*
16 *Glycera capitata*
17 *Haploscoloplos elongata*
18 *Mediomastus ambiseta*, *M. acutus*, or *M. californiensis*
19 *Monticellina dorsobranchialis*, *Tharyx* sp A SCAMIT, or *Tharyx* spp (in part)
20 *Nephtys cornuta franciscana*
21 *Owenia collaris*
22 *Pectinaria californiensis newportensis*
23 *Gyptis brevipalpa*
24 *Minuspio cirrifera*, *Prionospio cirrifera*, or *P. lighti*
25 *Prionospio* sp A of SCAMIT
26 *Scoloplos armiger* or *Scoloplos "armiger"*
27 *Thalanessa spinosa* or *Eusigalion spinosa*
28 *Spiophanes missionensis*
29 *Synchelidium rectipalmum*
30 *Synchelidium shoemakeri*
31 *Campylaspis* sp C MBC
32 *Cumella* sp A of Myers & Benedict
33 *Edotea sublittoralis*
34 *Megaluropus longimerus*
35 *Monoculodes hartmanae*
36 *Metaceradocus occidentalis*
37 *Jassa falcata*
38 *Nebalia* sp A SCAMIT 1995
39 *Callianasa* sp or *Callianasa californiensis*
40 *Photis* OC1 (MEC) 1996
41 *Paraphoxus epistomus* or *Rhepoxynius epistomus*
42 *Munna* sp
43 *Leptosynapta* sp B of Benedict, *L.* sp B of MBC
44 Hemichordata or Hemichordata, unid.

Appendix G-2. Infauna results by station. El Segundo and Scattergood Generating Stations NPDES, 2001.

		Station									
Phylum	Species	B1	B2	B3	B4	B5	B6	B7	B8	Total	Percent Total
AN	*Apoprionospio pygmaea*	453	313	40	599	4	24	31	32	1496	38.52
AR	*Diastylopsis tenuis*	17	12	-	-	1	10	79	123	242	6.23
MO	*Tellina modesta*	15	47	-	4	2	68	54	40	230	5.92
EC	*Dendraster excentricus*	4	-	2	-	52	44	30	-	132	3.40
AR	*Rhepoxynius abronius*	-	-	-	-	-	37	35	30	102	2.63
AR	*Mandibulophoxus gilesi*	-	-	34	55	-	-	-	-	89	2.29
AR	*Rhepoxynius menziesi*	5	-	-	1	-	8	36	31	81	2.09
AR	*Jassa slatteryi*	-	29	6	7	-	-	6	25	73	1.88
AN	*Prionospio (Minuspio) lighti*	4	59	-	-	-	-	-	-	63	1.62
AR	*Ampelisca agassizi*	-	-	-	-	-	3	23	34	60	1.54
AN	*Spiophanes bombyx*	7	5	-	7	1	16	12	10	58	1.49
AR	*Americhelidium shoemakeri*	-	1	2	13	10	14	7	9	56	1.44
AN	*Mediomastus acutus*	7	20	5	3	-	6	5	7	53	1.36
AR	*Gibberosus myersi*	-	-	-	2	-	2	10	28	42	1.08
AR	*Rudilemboides stenopropodus*	-	-	-	-	42	-	-	-	42	1.08
AN	*Pectinaria californiensis*	13	23	-	-	1	1	-	3	41	1.06
MO	*Solamen columbianum*	-	-	-	-	40	-	-	-	40	1.03
AR	*Argissa hamatipes*	-	-	-	-	12	23	3	-	38	0.98
NE	*Carinoma mutabilis*	9	2	9	12	-	-	1	2	35	0.90
AN	*Mediomastus* spp	3	20	-	-	9	1	-	-	33	0.85
AN	*Aonides* sp	-	-	-	-	27	-	-	-	27	0.70
AR	*Campylaspis* sp C Myers & Benedict 1974	1	2	-	1	18	4	1	-	27	0.70
AN	*Nephtys caecoides*	6	4	2	3	-	7	2	3	27	0.70
AN	*Spiophanes duplex*	1	1	-	-	6	3	5	10	26	0.67
AN	*Spiochaetopterus costarum*	8	8	-	1	-	2	5	-	24	0.62
MO	*Cooperella subdiaphana*	-	-	-	-	-	1	12	8	21	0.54
AN	*Protodorvillea gracilis*	-	-	-	-	21	-	-	-	21	0.54
AN	*Armandia brevis*	2	2	4	2	1	1	2	6	20	0.51
AR	*Photis* sp OC1 Diener 1992	-	-	-	-	4	5	4	5	18	0.46
AR	*Lamprops quadriplicatus*	-	-	-	-	1	5	6	5	17	0.44
AN	*Syllis (Typosyllis) farallonensis*	3	3	-	1	1	5	-	4	17	0.44
MO	*Macoma* sp	-	4	-	1	-	5	3	1	14	0.36
MO	*Caecum crebricinctum*	-	-	-	-	13	-	-	-	13	0.33
AR	*Hartmanodes hartmanae*	1	-	-	1	-	3	3	5	13	0.33
NE	*Tubulanus polymorphus*	1	6	-	1	3	2	-	-	13	0.33
AN	*Chaetozone setosa* Cmplx	1	-	-	-	1	4	3	3	12	0.31
AR	*Foxiphalus obtusidens*	-	-	-	-	-	-	2	10	12	0.31
AR	*Gibberosus devaneyi*	4	-	7	1	-	-	-	-	12	0.31
AN	*Nephtys cornuta*	-	-	-	-	1	8	1	2	12	0.31
CO	Enteropneusta	4	1	-	1	-	1	2	2	11	0.28
MO	*Mactromeris catilliformis*	-	11	-	-	-	-	-	-	11	0.28
NE	Lineidae	2	2	1	4	1	-	-	-	10	0.26
AN	*Owenia collaris*	-	1	-	4	-	-	2	3	10	0.26
AR	*Acuminodeutopus heteruropus*	-	-	-	-	-	3	-	6	9	0.23
AR	*Aoroides inermis*	-	-	-	-	-	-	-	9	9	0.23
AN	*Glycera nana*	-	-	-	-	9	-	-	-	9	0.23
AR	*Hemilamprops californicus*	-	-	-	-	4	3	2	-	9	0.23
AN	Maldanidae	1	-	-	-	7	1	-	-	9	0.23
NE	Nemertea	-	-	-	-	3	1	4	1	9	0.23
AN	*Onuphis eremita parva*	2	3	-	2	-	-	1	1	9	0.23
AR	*Stenothoe estacola*	-	3	1	-	-	-	-	5	9	0.23
MO	*Acteocina culcitella*	1	-	-	-	4	-	2	1	8	0.21
AN	*Aricidea (Acmira) catherinae*	1	-	-	-	1	2	4	-	8	0.21
AN	*Cirriformia moorei*	-	1	2	5	-	-	-	-	8	0.21
AR	*Leuroleberis sharpei*	-	-	-	-	6	-	2	-	8	0.21
MO	*Macoma secta*	2	1	-	-	-	4	1	-	8	0.21
MO	*Rochefortia tumida*	1	1	-	1	-	2	2	1	8	0.21
AN	*Caulleriella alata*	-	-	-	-	6	-	-	1	7	0.18
AR	*Edotia sublittoralis*	1	5	-	-	-	-	1	-	7	0.18
MO	*Macoma indentata*	2	4	-	-	-	-	-	1	7	0.18
MO	*Macoma nasuta*	3	4	-	-	-	-	-	-	7	0.18
NT	Nematoda	-	-	1	1	3	2	-	-	7	0.18
EC	Amphiuridae	3	-	-	-	2	-	-	1	6	0.15
AR	*Ancinus granulatus*	-	1	5	-	-	-	-	-	6	0.15
AR	*Elasmopus holgurus*	-	2	-	-	1	-	-	3	6	0.15
AR	*Metharpinia coronadoi*	-	-	-	-	6	-	-	-	6	0.15
AN	*Monticellina cryptica*	-	-	-	-	-	4	-	2	6	0.15
AR	*Neotrypaea calforniensis*	1	3	-	-	-	-	-	2	6	0.15
MO	*Olivella baetica*	1	1	1	-	-	1	1	1	6	0.15
AR	Oxyurostylis pacifica	-	-	-	-	3	3	-	-	6	0.15
AR	*Photis brevipes*	-	-	-	-	2	-	-	4	6	0.15
AN	*Polycirrus* sp	-	-	-	-	6	-	-	-	6	0.15
MO	*Rictaxis punctocaelatus*	-	2	-	4	-	-	-	-	6	0.15
PL	*Stylochoplana* sp	2	1	-	1	1	1	-	-	6	0.15
AN	*Glycera macrobranchia*	2	2	-	-	-	1	-	-	5	0.13
MO	*Halistylus pupoideus*	-	-	-	-	5	-	-	-	5	0.13
AN	*Hesionella mccullochae*	1	-	-	3	-	-	-	1	5	0.13
AN	*Hesionura coineaui difficilis*	-	-	-	-	5	-	-	-	5	0.13

Appendix G-2. (Cont.).

Phylum	Species	Station								Total	Percent Total
		B1	B2	B3	B4	B5	B6	B7	B8		
AR	*Leptocuma forsmani*	-	-	1	4	-	-	-	-	5	0.13
EC	*Leptosynapta* sp	1	-	-	-	2	-	1	1	5	0.13
AN	*Nereis latescens*	-	-	-	-	-	-	-	5	5	0.13
NE	*Paranemertes californica*	-	-	-	-	-	1	3	1	5	0.13
AN	*Phyllodoce hartmanae*	1	-	-	1	-	1	1	1	5	0.13
AN	*Podarkeopsis glabra*	-	4	-	-	-	1	-	-	5	0.13
MO	*Rochefortia grippi*	-	-	-	-	-	-	5	-	5	0.13
AN	*Spiophanes berkeleyorum*	1	3	-	-	1	-	-	-	5	0.13
AN	*Ampharete labrops*	1	-	-	-	2	-	1	-	4	0.10
AN	*Aphelochaeta glandaria*	-	-	-	-	-	2	-	2	4	0.10
CO	*Branchiostoma californiense*	-	-	-	-	4	-	-	-	4	0.10
AN	*Capitella capitata* Cmplx	-	-	-	-	4	-	-	-	4	0.10
MO	*Crepidula norrisiarum*	-	-	-	-	-	-	-	4	4	0.10
AN	*Goniada littorea*	-	1	-	-	-	1	1	1	4	0.10
AN	*Magelona pitelkai*	-	-	-	-	-	2	1	1	4	0.10
AN	*Paraprionospio pinnata*	-	-	-	-	-	2	1	1	4	0.10
AR	*Parasterope hulingsi*	1	-	-	-	-	1	1	1	4	0.10
AN	*Phyllodoce longipes*	-	-	-	-	2	2	-	-	4	0.10
AN	*Scoloplos armiger* Cmplx	1	-	-	2	-	1	-	-	4	0.10
CN	Actiniaria	-	-	-	3	-	-	-	-	3	0.08
AR	*Americhelidium rectipalmum*	-	-	-	-	3	-	-	-	3	0.08
AR	*Ampelisca cristata cristata*	-	-	-	-	1	1	1	-	3	0.08
EC	*Amphiodia digitata*	2	1	-	-	-	-	-	-	3	0.08
AN	*Eranno lagunae*	-	-	-	-	2	1	-	-	3	0.08
AN	Euclymeninae sp A SCAMIT 1987	-	-	-	-	-	1	2	-	3	0.08
AR	*Euphilomedes carcharodonta*	1	-	-	-	-	2	-	-	3	0.08
AN	*Eusyllis transecta*	-	-	-	-	2	-	-	1	3	0.08
AR	*Lepidopa californica*	-	-	1	2	-	-	-	-	3	0.08
AN	*Micropodarke dubia*	-	-	-	-	3	-	-	-	3	0.08
PR	*Phoronis* sp	1	-	-	-	-	1	-	1	3	0.08
AR	*Pinnixa longipes*	-	3	-	-	-	-	-	-	3	0.08
AN	*Sigalion spinosus*	-	-	-	-	-	1	-	2	3	0.08
MO	*Turbonilla almo*	-	-	-	-	-	-	3	-	3	0.08
MO	*Turbonilla santarosana*	-	-	-	-	-	2	1	-	3	0.08
AR	*Uromunna ubiquita*	-	-	-	1	-	-	1	1	3	0.08
MO	*Acteocina harpa*	-	1	-	-	-	-	1	-	2	0.05
AR	*Ammothea hilgendorfi*	-	-	1	-	-	-	-	1	2	0.05
AN	*Chone* sp SD1 Pt Loma 1997	1	1	-	-	-	-	-	-	2	0.05
AN	*Dipolydora socialis*	-	-	-	-	1	-	1	-	2	0.05
MO	*Ennucula tenuis*	-	1	-	-	-	1	-	-	2	0.05
MO	*Ensis myrae*	-	2	-	-	-	-	-	-	2	0.05
MO	*Epitonium sawinae*	1	-	-	1	-	-	-	-	2	0.05
AR	Harpacticoida	1	-	-	-	1	-	-	-	2	0.05
AR	*Isocheles pilosus*	1	-	-	1	-	-	-	-	2	0.05
MO	*Kurtziella plumbea*	-	2	-	-	-	-	-	-	2	0.05
MO	*Macoma yoldiformis*	-	1	-	-	-	-	-	1	2	0.05
AN	*Magelona sacculata*	-	-	-	-	-	2	-	-	2	0.05
AR	*Mysidopsis intii*	-	-	-	-	1	1	-	-	2	0.05
AR	*Nebalia daytoni*	-	-	-	-	1	-	-	1	2	0.05
AN	*Nephtys californiensis*	-	-	-	-	2	-	-	-	2	0.05
AN	*Nereiphylla castanea*	-	-	-	-	-	1	-	1	2	0.05
MO	*Neverita reclusiana*	-	2	-	-	-	-	-	-	2	0.05
AR	*Paramicrodeutopus schmitti*	-	-	-	-	2	-	-	-	2	0.05
AN	*Parandalia fauveli*	-	2	-	-	-	-	-	-	2	0.05
PR	Phorona	-	-	-	-	-	-	1	1	2	0.05
AR	*Pleusymtes subglaber*	-	1	-	-	-	-	-	1	2	0.05
AN	*Poecilochaetus johnsoni*	-	-	-	-	1	1	-	-	2	0.05
AN	*Polydora bioccipitalis*	-	-	-	1	-	-	1	-	2	0.05
AN	*Polydora* sp	-	-	-	-	-	-	-	2	2	0.05
MO	*Protothaca staminea*	-	-	-	-	-	-	2	-	2	0.05
AN	*Scoloplos acmeceps*	-	-	-	-	2	-	-	-	2	0.05
AN	*Tenonia priops*	-	-	-	-	2	-	-	-	2	0.05
AR	*Zeugophilomedes oblongatus*	-	-	-	-	2	-	-	-	2	0.05
AR	*Ampelisca brachycladus*	-	-	-	-	1	-	-	-	1	0.03
AR	*Amphideutopus oculatus*	-	-	-	-	-	1	-	-	1	0.03
AR	*Anchicolurus occidentalis*	-	-	-	1	-	-	-	-	1	0.03
CO	Ascidiacea	-	-	-	-	1	-	-	-	1	0.03
EC	*Astropecten verrilli*	-	-	-	-	-	1	-	-	1	0.03
MO	Bivalvia	-	-	-	-	1	-	-	-	1	0.03
AR	*Cancer* sp	-	-	-	-	-	-	-	1	1	0.03
AN	*Chaetozone corona*	-	-	-	-	-	-	-	1	1	0.03
AN	*Chone mollis*	-	-	-	-	1	-	-	-	1	0.03
AR	*Cumella californica*	-	-	-	-	1	-	-	-	1	0.03
AN	*Diopatra ornata*	-	-	-	-	1	-	-	-	1	0.03
CN	*Edwardsia* sp G MEC 1992	-	-	-	-	1	-	-	-	1	0.03
AR	*Ericthonius brasiliensis*	-	-	-	-	1	-	-	-	1	0.03
AN	*Eteone californica*	-	-	-	-	1	-	-	-	1	0.03
AN	*Eteone fauchaldi*	-	-	-	1	-	-	-	-	1	0.03

Appendix G-2. (Cont.).

Phylum	Species	Station B1	B2	B3	B4	B5	B6	B7	B8	Total	Percent Total
AN	*Euchone arenae*	-	-	-	-	1	-	-	-	1	0.03
BC	*Glottidia albida*	-	-	-	-	-	1	-	-	1	0.03
AN	*Goniada maculata*	-	-	-	-	-	1	-	-	1	0.03
AR	*Hornellia occidentalis*	-	-	-	-	1	-	-	-	1	0.03
AR	Janiridae	-	-	-	-	-	-	1	-	1	0.03
AN	*Leitoscoloplos pugettensis*	-	-	-	-	-	-	-	1	1	0.03
MO	*Leporimetis obesa*	-	1	-	-	-	-	-	-	1	0.03
MO	*Leptopecten latiauratus*	-	-	-	-	-	-	-	1	1	0.03
CN	Limnactiniidae sp A SCAMIT 1989	-	-	-	1	-	-	-	-	1	0.03
AN	*Lumbrineris japonica*	-	-	-	-	-	-	-	1	1	0.03
AN	*Magelona hartmanae*	-	-	1	-	-	-	-	-	1	0.03
AR	*Melphisana bola* Cmplx	-	-	-	-	-	1	-	-	1	0.03
AR	*Metatiron tropakis*	-	-	-	-	1	-	-	-	1	0.03
NE	*Micrura* sp	-	1	-	-	-	-	-	-	1	0.03
AR	*Monocorophium* sp	1	-	-	-	-	-	-	-	1	0.03
MO	*Mytilus galloprovincialis*	-	-	-	-	-	-	-	1	1	0.03
MO	*Nassarius perpinguis*	-	-	-	-	-	-	1	-	1	0.03
AR	*Neomysis kadiakensis*	-	-	-	-	-	1	-	-	1	0.03
AR	Oedicerotidae	-	-	-	-	-	-	-	1	1	0.03
AN	Oligochaeta	-	-	-	-	1	-	-	-	1	0.03
AN	*Onuphis* sp 1 Pt. Loma 1983	-	-	-	-	-	1	-	-	1	0.03
AR	*Pachynus barnardi*	-	-	-	-	-	1	-	-	1	0.03
AR	*Paguristes* sp	-	-	-	-	1	-	-	-	1	0.03
AN	*Paranaitis polynoides*	-	-	-	-	-	1	-	-	1	0.03
CN	Pennatulacea	-	-	-	-	-	-	-	1	1	0.03
MO	*Periploma discus*	-	-	-	-	-	1	-	-	1	0.03
AN	*Pherusa neopapillata*	-	-	-	-	1	-	-	-	1	0.03
AR	*Photis macinerneyi*	-	-	-	-	-	-	1	-	1	0.03
AN	*Phyllodoce* sp	1	-	-	-	-	-	-	-	1	0.03
PL	*Plehnia caeca*	1	-	-	-	-	-	-	-	1	0.03
AN	*Polydora cornuta*	-	-	-	-	-	-	-	1	1	0.03
AN	*Prionospio jubata*	-	-	-	-	1	-	-	-	1	0.03
AN	*Proceraea* sp	-	-	-	-	-	1	-	-	1	0.03
CN	*Scolanthus* sp A SCAMIT 1983	-	-	-	-	-	-	-	1	1	0.03
SI	*Siphonosoma ingens*	-	-	-	-	-	-	1	-	1	0.03
AR	Sphaeromatidae	-	-	-	1	-	-	-	-	1	0.03
AN	*Sthenelais verruculosa*	-	-	-	-	-	-	1	-	1	0.03
MO	*Tellina bodegensis*	-	-	1	-	-	-	-	-	1	0.03
NE	*Tetrastemma* sp A SCAMIT 1995	-	-	-	-	1	-	-	-	1	0.03
MO	*Yoldia cooperii*	-	-	-	-	-	-	1	-	1	0.03
	Number of individuals	612	637	127	761	404	381	440	522	3884	
	Number of species	54	54	21	42	80	75	64	74	196	
	Diversity (H')	1.48	2.26	2.18	1.12	3.54	3.35	3.14	3.20	3.19	

Appendix G-3. Infauna data by station and replicate. El Segundo and Scattergood Generating Stations NPDES, 2001.

Station B1

Phylum	Species	Replicate B1-I	B1-II	B1-III	B1-IV	Total	Percent Composition	Density No./m²
AN	*Apoprionospio pygmaea*	131	147	53	122	453	74.02	1132.5
AR	*Diastylopsis tenuis*	3	3	6	5	17	2.78	42.5
MO	*Tellina modesta*	2	4	3	6	15	2.45	37.5
AN	*Pectinaria californiensis*	4	4	2	3	13	2.12	32.5
NE	*Carinoma mutabilis*	4	2	2	1	9	1.47	22.5
AN	*Spiochaetopterus costarum*	4	1	-	3	8	1.31	20.0
AN	*Mediomastus acutus*	1	-	1	5	7	1.14	17.5
AN	*Spiophanes bombyx*	3	1	1	2	7	1.14	17.5
AN	*Nephtys caecoides*	2	1	2	1	6	0.98	15.0
AR	*Rhepoxynius menziesi*	3	-	2	-	5	0.82	12.5
EC	*Dendraster excentricus*	-	1	1	2	4	0.65	10.0
CO	Enteropneusta	-	-	4	-	4	0.65	10.0
AR	*Gibberosus devaneyi*	-	1	-	3	4	0.65	10.0
AN	*Prionospio (Minuspio) lighti*	1	2	-	1	4	0.65	10.0
EC	Amphiuridae	1	2	-	-	3	0.49	7.5
MO	*Macoma nasuta*	-	-	-	3	3	0.49	7.5
AN	*Mediomastus* spp	2	-	-	1	3	0.49	7.5
AN	*Syllis (Typosyllis) farallonensis*	1	-	2	-	3	0.49	7.5
EC	*Amphiodia digitata*	-	-	2	-	2	0.33	5.0
AN	*Armandia brevis*	1	-	-	1	2	0.33	5.0
AN	*Glycera macrobranchia*	1	-	-	1	2	0.33	5.0
NE	Lineidae	1	-	1	-	2	0.33	5.0
MO	*Macoma indentata*	-	1	-	1	2	0.33	5.0
MO	*Macoma secta*	-	-	1	1	2	0.33	5.0
AN	*Onuphis eremita parva*	-	1	1	-	2	0.33	5.0
PL	*Stylochoplana* sp	1	-	-	1	2	0.33	5.0
MO	*Acteocina culcitella*	-	1	-	-	1	0.16	2.5
AN	*Ampharete labrops*	1	-	-	-	1	0.16	2.5
AN	*Aricidea (Acmira) catherinae*	-	-	1	-	1	0.16	2.5
AR	*Campylaspis* sp C Myers & Benedict 1974	-	-	-	1	1	0.16	2.5
AN	*Chaetozone setosa* Cmplx	-	-	-	1	1	0.16	2.5
AN	*Chone* sp SD1 Pt Loma 1997	-	-	1	-	1	0.16	2.5
AR	*Edotia sublittoralis*	-	-	1	-	1	0.16	2.5
MO	*Epitonium sawinae*	-	-	1	-	1	0.16	2.5
AR	*Euphilomedes carcharodonta*	-	-	-	1	1	0.16	2.5
AR	Harpacticoida	1	-	-	-	1	0.16	2.5
AR	*Hartmanodes hartmanae*	-	-	1	-	1	0.16	2.5
AN	*Hesionella mccullochae*	1	-	-	-	1	0.16	2.5
AR	*Isocheles pilosus*	-	-	-	1	1	0.16	2.5
EC	*Leptosynapta* sp	-	-	1	-	1	0.16	2.5
AN	Maldanidae	-	1	-	-	1	0.16	2.5
AR	*Monocorophium* sp	1	-	-	-	1	0.16	2.5
AR	*Neotrypaea calforniensis*	-	-	1	-	1	0.16	2.5
MO	*Olivella baetica*	-	-	-	1	1	0.16	2.5
AR	*Parasterope hulingsi*	-	-	1	-	1	0.16	2.5
PR	*Phoronis* sp	-	1	-	-	1	0.16	2.5
AN	*Phyllodoce hartmanae*	-	-	-	1	1	0.16	2.5
AN	*Phyllodoce* sp	-	1	-	-	1	0.16	2.5
PL	*Plehnia caeca*	-	-	1	-	1	0.16	2.5
MO	*Rochefortia tumida*	-	-	-	1	1	0.16	2.5
AN	*Scoloplos armiger* Cmplx	-	-	-	1	1	0.16	2.5
AN	*Spiophanes berkeleyorum*	1	-	-	-	1	0.16	2.5
AN	*Spiophanes duplex*	1	-	-	-	1	0.16	2.5
NE	*Tubulanus polymorphus*	-	-	1	-	1	0.16	2.5

Summary

Parameter	Replicate B1-I	B1-II	B1-III	B1-IV	Station Total	Replicate Mean	S.D.
Number of individuals	172	175	94	171	612	153.0	39.4
Number of species	24	18	26	27	54	23.8	4.0
Diversity (H')	1.26	0.87	2.01	1.46	1.48	1.40	0.48

Appendix G-3. (Cont.).

Station B2

Phylum	Species	Replicate B2-I	B2-II	B2-III	B2-IV	Total	Percent Composition	Density No./m²
AN	*Apoprionospio pygmaea*	125	41	121	26	313	49.14	782.5
AN	*Prionospio (Minuspio) lighti*	25	5	16	13	59	9.26	147.5
MO	*Tellina modesta*	12	7	12	16	47	7.38	117.5
AR	*Jassa slatteryi*	5	1	17	6	29	4.55	72.5
AN	*Pectinaria californiensis*	9	2	7	5	23	3.61	57.5
AN	*Mediomastus acutus*	7	5	6	2	20	3.14	50.0
AN	*Mediomastus* spp	5	3	8	4	20	3.14	50.0
AR	*Diastylopsis tenuis*	2	4	1	5	12	1.88	30.0
MO	*Mactromeris catilliformis*	2	4	-	5	11	1.73	27.5
AN	*Spiochaetopterus costarum*	2	2	2	2	8	1.26	20.0
NE	*Tubulanus polymorphus*	1	1	2	2	6	0.94	15.0
AR	*Edotia sublittoralis*	-	-	-	5	5	0.78	12.5
AN	*Spiophanes bombyx*	-	1	2	2	5	0.78	12.5
MO	*Macoma indentata*	1	1	1	1	4	0.63	10.0
MO	*Macoma nasuta*	3	-	-	1	4	0.63	10.0
MO	*Macoma* sp	-	1	2	1	4	0.63	10.0
AN	*Nephtys caecoides*	1	1	-	2	4	0.63	10.0
AN	*Podarkeopsis glabra*	3	-	-	1	4	0.63	10.0
AR	*Neotrypaea calforniensis*	2	-	1	-	3	0.47	7.5
AN	*Onuphis eremita parva*	-	-	-	3	3	0.47	7.5
AR	*Pinnixa longipes*	1	-	2	-	3	0.47	7.5
AN	*Spiophanes berkeleyorum*	1	1	1	-	3	0.47	7.5
AR	*Stenothoe estacola*	1	-	1	1	3	0.47	7.5
AN	*Syllis (Typosyllis) farallonensis*	1	1	1	-	3	0.47	7.5
AN	*Armandia brevis*	-	1	1	-	2	0.31	5.0
AR	*Campylaspis* sp C Myers & Benedict 1974	-	-	1	1	2	0.31	5.0
NE	*Carinoma mutabilis*	-	-	-	2	2	0.31	5.0
AR	*Elasmopus holgurus*	-	-	-	2	2	0.31	5.0
MO	*Ensis myrae*	-	-	1	1	2	0.31	5.0
AN	*Glycera macrobranchia*	-	-	-	2	2	0.31	5.0
MO	*Kurtziella plumbea*	1	-	1	-	2	0.31	5.0
NE	Lineidae	-	1	1	-	2	0.31	5.0
MO	*Neverita reclusiana*	-	1	1	-	2	0.31	5.0
AN	*Parandalia fauveli*	2	-	-	-	2	0.31	5.0
MO	*Rictaxis punctocaelatus*	1	-	1	-	2	0.31	5.0
MO	*Acteocina harpa*	-	-	1	-	1	0.16	2.5
AR	*Americhelidium shoemakeri*	-	1	-	-	1	0.16	2.5
EC	*Amphiodia digitata*	-	-	1	-	1	0.16	2.5
AR	*Ancinus granulatus*	-	1	-	-	1	0.16	2.5
AN	*Chone* sp SD1 Pt Loma 1997	-	-	-	1	1	0.16	2.5
AN	*Cirriformia moorei*	-	-	1	-	1	0.16	2.5
MO	*Ennucula tenuis*	-	-	-	1	1	0.16	2.5
CO	Enteropneusta	-	1	-	-	1	0.16	2.5
AN	*Goniada littorea*	-	1	-	-	1	0.16	2.5
MO	*Leporimetis obesa*	-	1	-	-	1	0.16	2.5
MO	*Macoma secta*	1	-	-	-	1	0.16	2.5
MO	*Macoma yoldiformis*	1	-	-	-	1	0.16	2.5
NE	*Micrura* sp	1	-	-	-	1	0.16	2.5
MO	*Olivella baetica*	-	-	-	1	1	0.16	2.5
AN	*Owenia collaris*	-	-	-	1	1	0.16	2.5
AR	*Pleusymtes subglaber*	1	-	-	-	1	0.16	2.5
MO	*Rochefortia tumida*	-	-	1	-	1	0.16	2.5
AN	*Spiophanes duplex*	-	-	-	1	1	0.16	2.5
PL	*Stylochoplana* sp	-	-	-	1	1	0.16	2.5

Summary

Parameter	Replicate B2-I	B2-II	B2-III	B2-IV	Station Total	Replicate Mean	S.D.
Number of individuals	217	89	214	117	637	159.3	66.0
Number of species	27	25	29	31	54	28.0	2.6
Diversity (H')	1.80	2.25	1.86	2.84	2.26	2.19	0.48

Appendix G-3. (Cont.).

Station B3

Phylum	Species	Replicate B3-I	B3-II	B3-III	B3-IV	Total	Percent Composition	Density No./m²
AN	*Apoprionospio pygmaea*	8	17	4	11	40	31.50	100.0
AR	*Mandibulophoxus gilesi*	7	5	7	15	34	26.77	85.0
NE	*Carinoma mutabilis*	-	3	2	4	9	7.09	22.5
AR	*Gibberosus devaneyi*	2	1	-	4	7	5.51	17.5
AR	*Jassa slatteryi*	3	1	2	-	6	4.72	15.0
AN	*Mediomastus acutus*	3	-	1	1	5	3.94	12.5
AR	*Ancinus granulatus*	4	1	-	-	5	3.94	12.5
AN	*Armandia brevis*	1	1	1	1	4	3.15	10.0
AR	*Americhelidium shoemakeri*	1	-	1	-	2	1.57	5.0
AN	*Cirriformia moorei*	1	-	-	1	2	1.57	5.0
EC	*Dendraster excentricus*	1	1	-	-	2	1.57	5.0
AN	*Nephtys caecoides*	1	-	1	-	2	1.57	5.0
AR	*Lepidopa californica*	1	-	-	-	1	0.79	2.5
NE	Lineidae	-	1	-	-	1	0.79	2.5
NT	Nematoda	-	1	-	-	1	0.79	2.5
MO	*Olivella baetica*	1	-	-	-	1	0.79	2.5
AR	*Stenothoe estacola*	-	-	1	-	1	0.79	2.5
AR	*Ammothea hilgendorfi*	-	-	1	-	1	0.79	2.5
AR	*Leptocuma forsmani*	-	-	-	1	1	0.79	2.5
AN	*Magelona hartmanae*	1	-	-	-	1	0.79	2.5
MO	*Tellina bodegensis*	-	1	-	-	1	0.79	2.5

Summary

Parameter	Replicate B3-I	B3-II	B3-III	B3-IV	Station Total	Replicate Mean	S.D.
Number of individuals	35	33	21	38	127	31.8	7.5
Number of species	14	11	10	8	21	10.8	2.5
Diversity (H')	1.88	1.41	1.49	1.22	1.76	1.50	0.28

Appendix G-3. (Cont.).

Station B4

Phylum	Species	Replicate B4-I	B4-II	B4-III	B4-IV	Total	Percent Composition	Density No./m²
AN	*Apoprionospio pygmaea*	149	266	75	109	599	78.71	1497.5
AR	*Mandibulophoxus gilesi*	10	3	22	20	55	7.23	137.5
AR	*Americhelidium shoemakeri*	3	3	3	4	13	1.71	32.5
NE	*Carinoma mutabilis*	6	4	1	1	12	1.58	30.0
AR	*Jassa slatteryi*	2	1	3	1	7	0.92	17.5
AN	*Spiophanes bombyx*	1	3	3	-	7	0.92	17.5
AN	*Cirriformia moorei*	3	2	-	-	5	0.66	12.5
AR	*Leptocuma forsmani*	1	1	2	-	4	0.53	10.0
NE	Lineidae	2	1	-	1	4	0.53	10.0
AN	*Owenia collaris*	1	2	1	-	4	0.53	10.0
MO	*Rictaxis punctocaelatus*	1	1	2	-	4	0.53	10.0
MO	*Tellina modesta*	1	1	2	-	4	0.53	10.0
CN	Actiniaria	-	3	-	-	3	0.39	7.5
AN	*Hesionella mccullochae*	2	1	-	-	3	0.39	7.5
AN	*Mediomastus acutus*	-	2	1	-	3	0.39	7.5
AN	*Nephtys caecoides*	1	-	1	1	3	0.39	7.5
AN	*Armandia brevis*	1	-	-	1	2	0.26	5.0
AR	*Gibberosus myersi*	1	-	1	-	2	0.26	5.0
AR	*Lepidopa californica*	-	-	-	2	2	0.26	5.0
AN	*Onuphis eremita parva*	-	2	-	-	2	0.26	5.0
AN	*Scoloplos armiger* Cmplx	1	-	1	-	2	0.26	5.0
AR	*Anchicolurus occidentalis*	-	-	-	1	1	0.13	2.5
AR	*Campylaspis* sp C Myers & Benedict 1974	1	-	-	-	1	0.13	2.5
CO	Enteropneusta	1	-	-	-	1	0.13	2.5
MO	*Epitonium sawinae*	1	-	-	-	1	0.13	2.5
AN	*Eteone fauchaldi*	-	-	-	1	1	0.13	2.5
AR	*Gibberosus devaneyi*	1	-	-	-	1	0.13	2.5
AR	*Hartmanodes hartmanae*	1	-	-	-	1	0.13	2.5
AR	*Isocheles pilosus*	-	-	-	1	1	0.13	2.5
CN	Limnactiniidae sp A SCAMIT 1989	-	-	1	-	1	0.13	2.5
MO	*Macoma* sp	-	-	-	1	1	0.13	2.5
NT	Nematoda	-	-	-	1	1	0.13	2.5
AN	*Phyllodoce hartmanae*	-	1	-	-	1	0.13	2.5
AN	*Polydora bioccipitalis*	-	-	1	-	1	0.13	2.5
AR	*Rhepoxynius menziesi*	-	-	1	-	1	0.13	2.5
MO	*Rochefortia tumida*	1	-	-	-	1	0.13	2.5
AR	Sphaeromatidae	-	-	-	1	1	0.13	2.5
AN	*Spiochaetopterus costarum*	-	1	-	-	1	0.13	2.5
PL	*Stylochoplana* sp	-	1	-	-	1	0.13	2.5
AN	*Syllis (Typosyllis) farallonensis*	-	-	1	-	1	0.13	2.5
NE	*Tubulanus polymorphus*	1	-	-	-	1	0.13	2.5
AR	*Uromunna ubiquita*	1	-	-	-	1	0.13	2.5

Summary

Parameter	Replicate B4-I	B4-II	B4-III	B4-IV	Station Total	Replicate Mean	S.D.
Number of individuals	194	299	122	146	761	190.3	78.4
Number of species	25	19	18	15	42	19.3	4.2
Diversity (H')	1.20	0.65	1.48	1.02	1.12	1.09	0.35

Appendix G-3. (Cont.).

Station B5

Phylum	Species	Replicate B5-I	B5-II	B5-III	B5-IV	Total	Percent Composition	Density No./m²
EC	*Dendraster excentricus*	3	33	3	13	52	12.87	130.0
AR	*Rudilemboides stenopropodus*	-	4	24	14	42	10.40	105.0
MO	*Solamen columbianum*	8	10	12	10	40	9.90	100.0
AN	*Aonides* sp	3	20	3	1	27	6.68	67.5
AN	*Protodorvillea gracilis*	3	13	5	-	21	5.20	52.5
AR	*Campylaspis* sp C Myers & Benedict 1974	-	1	11	6	18	4.46	45.0
MO	*Caecum crebricinctum*	5	3	-	5	13	3.22	32.5
AR	*Argissa hamatipes*	-	-	10	2	12	2.97	30.0
AR	*Americhelidium shoemakeri*	-	2	1	7	10	2.48	25.0
AN	*Glycera nana*	2	1	1	5	9	2.23	22.5
AN	*Mediomastus* spp	1	-	8	-	9	2.23	22.5
AN	Maldanidae	2	3	2	-	7	1.73	17.5
AN	*Caulleriella alata*	-	1	5	-	6	1.49	15.0
AN	*Polycirrus* sp	-	3	-	3	6	1.49	15.0
AN	*Spiophanes duplex*	-	3	3	-	6	1.49	15.0
AR	*Leuroleberis sharpei*	-	-	4	2	6	1.49	15.0
AR	*Metharpinia coronadoi*	-	3	-	3	6	1.49	15.0
AN	*Hesionura coineaui difficilis*	2	3	-	-	5	1.24	12.5
MO	*Halistylus pupoideus*	3	-	-	2	5	1.24	12.5
AN	*Apoprionospio pygmaea*	-	1	3	-	4	0.99	10.0
AN	*Capitella capitata* Cmplx	-	-	4	-	4	0.99	10.0
AR	*Hemilamprops californicus*	1	2	1	-	4	0.99	10.0
AR	*Photis* sp OC1 Diener 1992	2	-	2	-	4	0.99	10.0
CO	*Branchiostoma californiense*	-	3	-	1	4	0.99	10.0
MO	*Acteocina culcitella*	-	1	-	3	4	0.99	10.0
AN	*Micropodarke dubia*	1	-	1	1	3	0.74	7.5
AR	*Americhelidium rectipalmum*	-	2	-	1	3	0.74	7.5
AR	Oxyurostylis pacifica	-	-	3	-	3	0.74	7.5
NE	Nemertea	2	-	-	1	3	0.74	7.5
NE	*Tubulanus polymorphus*	-	-	3	-	3	0.74	7.5
NT	Nematoda	-	2	-	1	3	0.74	7.5
AN	*Ampharete labrops*	-	2	-	-	2	0.50	5.0
AN	*Eranno lagunae*	-	1	1	-	2	0.50	5.0
AN	*Eusyllis transecta*	1	-	-	1	2	0.50	5.0
AN	*Nephtys californiensis*	-	1	-	1	2	0.50	5.0
AN	*Phyllodoce longipes*	-	-	1	1	2	0.50	5.0
AN	*Scoloplos acmeceps*	-	1	-	1	2	0.50	5.0
AN	*Tenonia priops*	-	-	1	1	2	0.50	5.0
AR	*Paramicrodeutopus schmitti*	1	1	-	-	2	0.50	5.0
AR	*Photis brevipes*	-	-	2	-	2	0.50	5.0
AR	*Zeugophilomedes oblongatus*	-	1	-	1	2	0.50	5.0
EC	Amphiuridae	-	-	2	-	2	0.50	5.0
EC	*Leptosynapta* sp	-	-	2	-	2	0.50	5.0
MO	*Tellina modesta*	-	-	1	1	2	0.50	5.0
AN	*Aricidea (Acmira) catherinae*	-	-	1	-	1	0.25	2.5
AN	*Armandia brevis*	-	-	1	-	1	0.25	2.5
AN	*Chaetozone setosa* Cmplx	-	-	1	-	1	0.25	2.5
AN	*Chone mollis*	-	-	1	-	1	0.25	2.5
AN	*Diopatra ornata*	1	-	-	-	1	0.25	2.5
AN	*Dipolydora socialis*	-	-	1	-	1	0.25	2.5
AN	*Eteone californica*	-	-	-	1	1	0.25	2.5
AN	*Euchone arenae*	1	-	-	-	1	0.25	2.5
AN	*Nephtys cornuta*	-	-	1	-	1	0.25	2.5
AN	Oligochaeta	-	1	-	-	1	0.25	2.5
AN	*Pectinaria californiensis*	-	-	1	-	1	0.25	2.5
AN	*Pherusa neopapillata*	-	-	1	-	1	0.25	2.5
AN	*Poecilochaetus johnsoni*	-	1	-	-	1	0.25	2.5
AN	*Prionospio jubata*	-	-	1	-	1	0.25	2.5
AN	*Spiophanes berkeleyorum*	1	-	-	-	1	0.25	2.5
AN	*Spiophanes bombyx*	-	-	-	1	1	0.25	2.5
AN	*Syllis (Typosyllis) farallonensis*	-	1	-	-	1	0.25	2.5
AR	*Ampelisca brachycladus*	-	-	1	-	1	0.25	2.5
AR	*Ampelisca cristata cristata*	-	-	1	-	1	0.25	2.5
AR	*Cumella californica*	-	-	-	1	1	0.25	2.5
AR	*Diastylopsis tenuis*	-	-	1	-	1	0.25	2.5
AR	*Elasmopus holgurus*	-	-	-	1	1	0.25	2.5
AR	*Ericthonius brasiliensis*	-	1	-	-	1	0.25	2.5
AR	Harpacticoida	-	1	-	-	1	0.25	2.5
AR	*Hornellia occidentalis*	1	-	-	-	1	0.25	2.5
AR	*Lamprops quadriplicatus*	-	1	-	-	1	0.25	2.5

Appendix G-3. (Cont.).

Station B5

Phylum	Species	Replicate B5-I	B5-II	B5-III	B5-IV	Total	Percent Composition	Density No./m²
AR	*Metatiron tropakis*	-	-	1	-	1	0.25	2.5
AR	*Mysidopsis intii*	-	-	-	1	1	0.25	2.5
AR	*Nebalia daytoni*	-	-	1	-	1	0.25	2.5
AR	*Paguristes* sp	-	-	1	-	1	0.25	2.5
CN	*Edwardsia* sp G MEC 1992	-	1	-	-	1	0.25	2.5
CO	Ascidiacea	-	-	1	-	1	0.25	2.5
MO	Bivalvia	1	-	-	-	1	0.25	2.5
NE	Lineidae	-	-	1	-	1	0.25	2.5
NE	*Tetrastemma* sp A SCAMIT 1995	-	-	-	1	1	0.25	2.5
PL	*Stylochoplana* sp	-	-	1	-	1	0.25	2.5

Summary

Parameter	Replicate B5-I	B5-II	B5-III	B5-IV	Station Total	Replicate Mean	S.D.
Number of individuals	45	128	137	94	404	101.0	41.7
Number of species	21	34	46	32	80	33.3	10.2
Diversity (H')	2.81	2.76	3.27	2.97	3.54	2.95	0.23

Appendix G-3. (Cont.).

Station B6

Phylum	Species	Replicate B6-I	B6-II	B6-III	B6-IV	Total	Percent Composition	Density No./m²
MO	*Tellina modesta*	10	13	11	34	68	17.85	170.0
EC	*Dendraster excentricus*	14	3	12	15	44	11.55	110.0
AR	*Rhepoxynius abronius*	20	2	6	9	37	9.71	92.5
AN	*Apoprionospio pygmaea*	7	3	9	5	24	6.30	60.0
AR	*Argissa hamatipes*	4	10	-	9	23	6.04	57.5
AN	*Spiophanes bombyx*	2	2	9	3	16	4.20	40.0
AR	*Americhelidium shoemakeri*	1	9	4	-	14	3.67	35.0
AR	*Diastylopsis tenuis*	3	3	-	4	10	2.62	25.0
AN	*Nephtys cornuta*	5	2	1	-	8	2.10	20.0
AR	*Rhepoxynius menziesi*	3	1	2	2	8	2.10	20.0
AN	*Nephtys caecoides*	1	4	-	2	7	1.84	17.5
AN	*Mediomastus acutus*	-	-	3	3	6	1.57	15.0
AN	*Syllis (Typosyllis) farallonensis*	1	1	2	1	5	1.31	12.5
AR	*Lamprops quadriplicatus*	1	1	2	1	5	1.31	12.5
AR	*Photis* sp OC1 Diener 1992	-	1	1	3	5	1.31	12.5
MO	*Macoma* sp	1	3	-	1	5	1.31	12.5
AN	*Chaetozone setosa* Cmplx	-	1	2	1	4	1.05	10.0
AN	*Monticellina cryptica*	2	1	-	1	4	1.05	10.0
AR	*Campylaspis* sp C Myers & Benedict 1974	1	1	1	1	4	1.05	10.0
MO	*Macoma secta*	1	-	-	3	4	1.05	10.0
AN	*Spiophanes duplex*	-	-	2	1	3	0.79	7.5
AR	*Acuminodeutopus heteruropus*	-	1	-	2	3	0.79	7.5
AR	*Ampelisca agassizi*	1	-	1	1	3	0.79	7.5
AR	*Hartmanodes hartmanae*	-	2	1	-	3	0.79	7.5
AR	*Hemilamprops californicus*	-	2	-	1	3	0.79	7.5
AR	Oxyurostylis pacifica	-	3	-	-	3	0.79	7.5
AN	*Aphelochaeta glandaria*	-	1	-	1	2	0.52	5.0
AN	*Aricidea (Acmira) catherinae*	2	-	-	-	2	0.52	5.0
AN	*Magelona pitelkai*	1	-	-	1	2	0.52	5.0
AN	*Magelona sacculata*	-	1	-	1	2	0.52	5.0
AN	*Paraprionospio pinnata*	1	-	1	-	2	0.52	5.0
AN	*Phyllodoce longipes*	1	-	-	1	2	0.52	5.0
AN	*Spiochaetopterus costarum*	-	1	1	-	2	0.52	5.0
AR	*Euphilomedes carcharodonta*	-	2	-	-	2	0.52	5.0
AR	*Gibberosus myersi*	1	1	-	-	2	0.52	5.0
MO	*Rochefortia tumida*	-	1	1	-	2	0.52	5.0
MO	*Turbonilla santarosana*	-	1	1	-	2	0.52	5.0
NE	*Tubulanus polymorphus*	2	-	-	-	2	0.52	5.0
NT	Nematoda	-	-	2	-	2	0.52	5.0
AN	*Armandia brevis*	-	-	1	-	1	0.26	2.5
AN	*Eranno lagunae*	-	-	-	1	1	0.26	2.5
AN	Euclymeninae sp A SCAMIT 1987	1	-	-	-	1	0.26	2.5
AN	*Glycera macrobranchia*	-	1	-	-	1	0.26	2.5
AN	*Goniada littorea*	1	-	-	-	1	0.26	2.5
AN	*Goniada maculata*	-	-	1	-	1	0.26	2.5
AN	Maldanidae	1	-	-	-	1	0.26	2.5
AN	*Mediomastus* spp	-	1	-	-	1	0.26	2.5
AN	*Nereiphylla castanea*	-	1	-	-	1	0.26	2.5
AN	*Onuphis* sp 1 Pt. Loma 1983	1	-	-	-	1	0.26	2.5
AN	*Paranaitis polynoides*	1	-	-	-	1	0.26	2.5
AN	*Pectinaria californiensis*	-	-	-	1	1	0.26	2.5
AN	*Phyllodoce hartmanae*	1	-	-	-	1	0.26	2.5
AN	*Podarkeopsis glabra*	-	1	-	-	1	0.26	2.5
AN	*Poecilochaetus johnsoni*	-	1	-	-	1	0.26	2.5
AN	*Proceraea* sp	-	-	-	1	1	0.26	2.5
AN	*Scoloplos armiger* Cmplx	1	-	-	-	1	0.26	2.5
AN	*Sigalion spinosus*	1	-	-	-	1	0.26	2.5
AR	*Ampelisca cristata cristata*	-	-	-	1	1	0.26	2.5
AR	*Amphideutopus oculatus*	-	-	-	1	1	0.26	2.5
AR	*Melphisana bola* Cmplx	-	-	-	1	1	0.26	2.5
AR	*Mysidopsis intii*	-	-	1	-	1	0.26	2.5
AR	*Neomysis kadiakensis*	1	-	-	-	1	0.26	2.5
AR	*Pachynus barnardi*	-	1	-	-	1	0.26	2.5
AR	*Parasterope hulingsi*	-	1	-	-	1	0.26	2.5
BC	*Glottidia albida*	-	-	1	-	1	0.26	2.5
CO	Enteropneusta	1	-	-	-	1	0.26	2.5
EC	*Astropecten verrilli*	-	-	1	-	1	0.26	2.5
MO	*Cooperella subdiaphana*	-	-	1	-	1	0.26	2.5
MO	*Ennucula tenuis*	-	-	-	1	1	0.26	2.5
MO	*Olivella baetica*	-	-	1	-	1	0.26	2.5

Appendix G-3. (Cont.).

Station B6

Phylum	Species	Replicate B6-I	B6-II	B6-III	B6-IV	Total	Percent Composition	Density No./m²
MO	*Periploma discus*	1	-	-	-	1	0.26	2.5
NE	Nemertea	1	-	-	-	1	0.26	2.5
NE	*Paranemertes californica*	-	-	1	-	1	0.26	2.5
PL	*Stylochoplana* sp	1	-	-	-	1	0.26	2.5
PR	*Phoronis* sp	-	-	-	1	1	0.26	2.5

Summary

Parameter	Replicate B6-I	B6-II	B6-III	B6-IV	Station Total	Replicate Mean	S.D.
Number of individuals	99	84	83	115	381	95.3	15.1
Number of species	37	36	30	34	75	34.3	3.1
Diversity (H')	2.99	3.16	2.93	2.74	3.35	2.95	0.18

Appendix G-3. (Cont.).

Station B7

Phylum	Species	Replicate B7-I	B7-II	B7-III	B7-IV	Total	Percent Composition	Density No./m²
AR	*Diastylopsis tenuis*	40	-	24	15	79	17.95	197.5
MO	*Tellina modesta*	8	10	15	21	54	12.27	135.0
AR	*Rhepoxynius menziesi*	6	16	5	9	36	8.18	90.0
AR	*Rhepoxynius abronius*	8	11	9	7	35	7.95	87.5
AN	*Apoprionospio pygmaea*	2	10	5	14	31	7.05	77.5
EC	*Dendraster excentricus*	12	11	5	2	30	6.82	75.0
AR	*Ampelisca agassizi*	1	5	11	6	23	5.23	57.5
AN	*Spiophanes bombyx*	1	6	3	2	12	2.73	30.0
MO	*Cooperella subdiaphana*	-	7	-	5	12	2.73	30.0
AR	*Gibberosus myersi*	2	6	1	1	10	2.27	25.0
AR	*Americhelidium shoemakeri*	2	1	2	2	7	1.59	17.5
AR	*Jassa slatteryi*	1	2	1	2	6	1.36	15.0
AR	*Lamprops quadriplicatus*	1	-	1	4	6	1.36	15.0
AN	*Mediomastus acutus*	2	-	2	1	5	1.14	12.5
AN	*Spiochaetopterus costarum*	2	1	1	1	5	1.14	12.5
AN	*Spiophanes duplex*	-	-	2	3	5	1.14	12.5
MO	*Rochefortia grippi*	-	5	-	-	5	1.14	12.5
AN	*Aricidea (Acmira) catherinae*	1	2	-	1	4	0.91	10.0
AR	*Photis* sp OC1 Diener 1992	3	-	1	-	4	0.91	10.0
NE	Nemertea	1	-	1	2	4	0.91	10.0
AN	*Chaetozone setosa* Cmplx	-	-	2	1	3	0.68	7.5
AR	*Argissa hamatipes*	-	-	-	3	3	0.68	7.5
AR	*Hartmanodes hartmanae*	1	-	-	2	3	0.68	7.5
MO	*Macoma* sp	2	-	-	1	3	0.68	7.5
MO	*Turbonilla almo*	2	1	-	-	3	0.68	7.5
NE	*Paranemertes californica*	1	-	-	2	3	0.68	7.5
AN	*Armandia brevis*	-	2	-	-	2	0.45	5.0
AN	Euclymeninae sp A SCAMIT 1987	1	1	-	-	2	0.45	5.0
AN	*Nephtys caecoides*	1	-	-	1	2	0.45	5.0
AN	*Owenia collaris*	-	2	-	-	2	0.45	5.0
AR	*Foxiphalus obtusidens*	-	2	-	-	2	0.45	5.0
AR	*Hemilamprops californicus*	2	-	-	-	2	0.45	5.0
AR	*Leuroleberis sharpei*	-	1	-	1	2	0.45	5.0
CO	Enteropneusta	2	-	-	-	2	0.45	5.0
MO	*Acteocina culcitella*	1	-	1	-	2	0.45	5.0
MO	*Protothaca staminea*	1	-	1	-	2	0.45	5.0
MO	*Rochefortia tumida*	2	-	-	-	2	0.45	5.0
AN	*Ampharete labrops*	-	-	-	1	1	0.23	2.5
AN	*Dipolydora socialis*	-	-	1	-	1	0.23	2.5
AN	*Goniada littorea*	-	-	1	-	1	0.23	2.5
AN	*Magelona pitelkai*	-	-	1	-	1	0.23	2.5
AN	*Nephtys cornuta*	1	-	-	-	1	0.23	2.5
AN	*Onuphis eremita parva*	-	-	1	-	1	0.23	2.5
AN	*Paraprionospio pinnata*	-	-	1	-	1	0.23	2.5
AN	*Phyllodoce hartmanae*	-	-	1	-	1	0.23	2.5
AN	*Polydora bioccipitalis*	-	1	-	-	1	0.23	2.5
AN	*Sthenelais verruculosa*	-	-	-	1	1	0.23	2.5
AR	*Ampelisca cristata cristata*	-	-	1	-	1	0.23	2.5
AR	*Campylaspis* sp C Myers & Benedict 1974	-	-	1	-	1	0.23	2.5
AR	*Edotia sublittoralis*	-	-	-	1	1	0.23	2.5
AR	Janiridae	-	1	-	-	1	0.23	2.5
AR	*Parasterope hulingsi*	-	-	-	1	1	0.23	2.5
AR	*Photis macinerneyi*	-	-	-	1	1	0.23	2.5
AR	*Uromunna ubiquita*	1	-	-	-	1	0.23	2.5
EC	*Leptosynapta* sp	-	-	-	1	1	0.23	2.5
MO	*Acteocina harpa*	-	1	-	-	1	0.23	2.5
MO	*Macoma secta*	-	-	-	1	1	0.23	2.5
MO	*Nassarius perpinguis*	-	-	1	-	1	0.23	2.5
MO	*Olivella baetica*	-	-	-	1	1	0.23	2.5
MO	*Turbonilla santarosana*	-	-	1	-	1	0.23	2.5
MO	*Yoldia cooperii*	-	-	-	1	1	0.23	2.5
NE	*Carinoma mutabilis*	-	-	-	1	1	0.23	2.5
PR	Phorona	-	-	1	-	1	0.23	2.5
SI	*Siphonosoma ingens*	1	-	-	-	1	0.23	2.5

Summary

Parameter	Replicate B7-I	B7-II	B7-III	B7-IV	Station Total	Replicate Mean	S.D.
Number of individuals	112	105	104	119	440	110.0	7.0
Number of species	31	23	31	35	64	30.0	5.0
Diversity (H')	2.59	2.74	2.76	2.97	3.14	2.76	0.16

Appendix G-3. (Cont.).

Station B8

Phylum	Species	Replicate B8-I	B8-II	B8-III	B8-IV	Total	Percent Composition	Density No./m²
AR	*Diastylopsis tenuis*	13	32	17	61	123	23.56	307.5
MO	*Tellina modesta*	6	11	11	12	40	7.66	100.0
AR	*Ampelisca agassizi*	1	23	6	4	34	6.51	85.0
AN	*Apoprionospio pygmaea*	9	9	10	4	32	6.13	80.0
AR	*Rhepoxynius menziesi*	7	14	3	7	31	5.94	77.5
AR	*Rhepoxynius abronius*	9	11	4	6	30	5.75	75.0
AR	*Gibberosus myersi*	2	13	2	11	28	5.36	70.0
AR	*Jassa slatteryi*	7	3	13	2	25	4.79	62.5
AN	*Spiophanes bombyx*	1	4	2	3	10	1.92	25.0
AN	*Spiophanes duplex*	-	5	1	4	10	1.92	25.0
AR	*Foxiphalus obtusidens*	1	2	5	2	10	1.92	25.0
AR	*Americhelidium shoemakeri*	4	1	2	2	9	1.72	22.5
AR	*Aoroides inermis*	-	-	9	-	9	1.72	22.5
MO	*Cooperella subdiaphana*	1	2	3	2	8	1.53	20.0
AN	*Mediomastus acutus*	1	2	3	1	7	1.34	17.5
AN	*Armandia brevis*	-	2	3	1	6	1.15	15.0
AR	*Acuminodeutopus heteruropus*	1	4	-	1	6	1.15	15.0
AN	*Nereis latescens*	-	-	5	-	5	0.96	12.5
AR	*Hartmanodes hartmanae*	-	-	4	1	5	0.96	12.5
AR	*Lamprops quadriplicatus*	-	1	2	2	5	0.96	12.5
AR	*Photis* sp OC1 Diener 1992	-	3	1	1	5	0.96	12.5
AR	*Stenothoe estacola*	2	-	3	-	5	0.96	12.5
AN	*Syllis (Typosyllis) farallonensis*	2	-	-	2	4	0.77	10.0
AR	*Photis brevipes*	-	3	1	-	4	0.77	10.0
MO	*Crepidula norrisiarum*	-	-	4	-	4	0.77	10.0
AN	*Chaetozone setosa* Cmplx	1	1	-	1	3	0.57	7.5
AN	*Nephtys caecoides*	3	-	-	-	3	0.57	7.5
AN	*Owenia collaris*	-	1	1	1	3	0.57	7.5
AN	*Pectinaria californiensis*	-	1	-	2	3	0.57	7.5
AR	*Elasmopus holgurus*	1	-	2	-	3	0.57	7.5
AN	*Aphelochaeta glandaria*	-	1	-	1	2	0.38	5.0
AN	*Monticellina cryptica*	2	-	-	-	2	0.38	5.0
AN	*Nephtys cornuta*	2	-	-	-	2	0.38	5.0
AN	*Polydora* sp	-	-	2	-	2	0.38	5.0
AN	*Sigalion spinosus*	1	-	1	-	2	0.38	5.0
AR	*Neotrypaea calforniensis*	1	1	-	-	2	0.38	5.0
CO	Enteropneusta	1	-	1	-	2	0.38	5.0
NE	*Carinoma mutabilis*	1	-	-	1	2	0.38	5.0
AN	*Caulleriella alata*	-	-	1	-	1	0.19	2.5
AN	*Chaetozone corona*	-	-	-	1	1	0.19	2.5
AN	*Eusyllis transecta*	-	-	1	-	1	0.19	2.5
AN	*Goniada littorea*	1	-	-	-	1	0.19	2.5
AN	*Hesionella mccullochae*	1	-	-	-	1	0.19	2.5
AN	*Leitoscoloplos pugettensis*	-	1	-	-	1	0.19	2.5
AN	*Lumbrineris japonica*	-	-	1	-	1	0.19	2.5
AN	*Magelona pitelkai*	-	-	1	-	1	0.19	2.5
AN	*Nereiphylla castanea*	1	-	-	-	1	0.19	2.5
AN	*Onuphis eremita parva*	-	-	-	1	1	0.19	2.5
AN	*Paraprionospio pinnata*	-	-	-	1	1	0.19	2.5
AN	*Phyllodoce hartmanae*	-	1	-	-	1	0.19	2.5
AN	*Polydora cornuta*	-	-	1	-	1	0.19	2.5
AR	*Ammothea hilgendorfi*	-	-	-	1	1	0.19	2.5
AR	*Cancer* sp	-	-	1	-	1	0.19	2.5
AR	*Nebalia daytoni*	1	-	-	-	1	0.19	2.5
AR	Oedicerotidae	-	-	-	1	1	0.19	2.5
AR	*Parasterope hulingsi*	-	-	-	1	1	0.19	2.5
AR	*Pleusymtes subglaber*	-	-	1	-	1	0.19	2.5
AR	*Uromunna ubiquita*	-	-	-	1	1	0.19	2.5
CN	Pennatulacea	-	1	-	-	1	0.19	2.5
CN	*Scolanthus* sp A SCAMIT 1983	-	1	-	-	1	0.19	2.5
EC	Amphiuridae	1	-	-	-	1	0.19	2.5
EC	*Leptosynapta* sp	-	1	-	-	1	0.19	2.5
MO	*Acteocina culcitella*	-	-	1	-	1	0.19	2.5
MO	*Leptopecten latiauratus*	-	-	1	-	1	0.19	2.5
MO	*Macoma indentata*	-	-	1	-	1	0.19	2.5
MO	*Macoma* sp	-	1	-	-	1	0.19	2.5
MO	*Macoma yoldiformis*	1	-	-	-	1	0.19	2.5
MO	*Mytilus galloprovincialis*	-	1	-	-	1	0.19	2.5
MO	*Olivella baetica*	-	-	-	1	1	0.19	2.5

Appendix G-3. (Cont.).

Station B8

Phylum	Species	Replicate B8-I	B8-II	B8-III	B8-IV	Total	Percent Composition	Density No./m^2
MO	*Rochefortia tumida*	-	-	1	-	1	0.19	2.5
NE	Nemertea	-	-	1	-	1	0.19	2.5
NE	*Paranemertes californica*	-	1	-	-	1	0.19	2.5
PR	Phorona	-	-	1	-	1	0.19	2.5
PR	*Phoronis* sp	-	-	-	1	1	0.19	2.5

Summary

Parameter	Replicate B8-I	B8-II	B8-III	B8-IV	Station Total	Replicate Mean	S.D.
Number of individuals	86	158	134	144	522	51.5	25.1
Number of species	31	32	41	34	74	34.5	4.5
Diversity (H')	2.98	2.78	3.26	2.46	3.20	2.87	0.34

Appendix G-4. Infaunal wet weight biomass data (g). El Segundo and Scattergood Generating Stations NPDES, 2001.

Sta-Rep	Annelida	Arthropoda	Mollusca	Echinodermata	Misc.	Total
B1-I	0.226	0.063	0.011	0.057	0.052	0.409
B1-II	0.252	0.016	0.059	<0.001	0.005	0.332
B1-III	0.127	0.026	0.050	0.035	0.030	0.268
B1-IV	0.149	0.006	0.095	0.060	0.082	0.392
Total	0.754	0.111	0.215	0.152	0.169	1.401
B2-I	1.336	0.120	0.173	-	0.271	1.900
B2-II	0.555	0.012	1.364	-	0.014	1.945
B2-III	1.171	0.004	0.187	0.050	0.032	1.444
B2-IV	0.772	0.026	0.382	-	0.016	1.196
Total	3.834	0.162	2.106	0.050	0.333	6.485
B3-I	0.144	0.063	0.117	0.025	-	0.349
B3-II	0.073	0.024	0.028	0.004	0.007	0.136
B3-III	0.065	0.028	-	-	0.012	0.105
B3-IV	0.017	0.017	-	-	0.019	0.053
Total	0.299	0.132	0.145	0.029	0.038	0.643
B4-I	0.041	0.072	0.007	-	0.187	0.307
B4-II	0.182	0.006	0.017	-	0.027	0.232
B4-III	0.026	0.025	0.030	-	0.018	0.099
B4-IV	0.033	0.037	0.027	-	0.056	0.153
Total	0.282	0.140	0.081	-	0.288	0.791
B5-I	0.045	0.114	0.059	0.009	0.010	0.237
B5-II	0.312	0.024	0.004	0.020	0.026	0.386
B5-III	0.028	0.030	0.014	0.051	0.015	0.138
B5-IV	0.022	0.040	0.039	0.560	0.130	0.791
Total	0.407	0.208	0.116	0.640	0.181	1.552
B6-I	0.493	0.004	0.085	0.048	0.090	0.720
B6-II	0.084	0.030	0.079	0.027	-	0.220
B6-III	0.044	0.013	0.008	0.288	0.002	0.355
B6-IV	0.155	0.054	0.100	0.008	0.023	0.340
Total	0.776	0.101	0.272	0.371	0.115	1.635
B7-I	0.141	0.031	0.015	0.033	0.186	0.406
B7-II	0.037	0.028	0.030	0.001	-	0.096
B7-III	0.117	0.112	0.052	0.004	0.015	0.300
B7-IV	0.037	0.040	0.059	0.080	0.002	0.218
Total	0.332	0.211	0.156	0.118	0.203	1.020
B8-I	0.159	0.033	0.043	0.017	0.020	0.272
B8-II	0.059	0.067	0.025	0.479	0.123	0.753
B8-III	0.110	0.061	0.184	-	0.217	0.572
B8-IV	0.058	0.148	0.036	-	0.011	0.253
Total	0.386	0.309	0.288	0.496	0.371	1.850
Grand Total	7.070	1.374	3.379	1.856	1.698	15.377

Note: - = no animals

Appendix G-5. Yearly infauna abundance, 1991 - 2001. El Segundo and Scattergood Generating Stations NPDES, 2001.

Phylum	Species	Year 1991	1992	1993	1994	1997	1998*	1999	2000	2001	Total
AN	*Apoprionospio pygmaea*	109	29	548	906	114	708	46	313	1496	4269
MO	*Donax gouldii*	-	-	-	-	-	4	-	4242	-	4246
AR	*Diastylopsis tenuis*	95	12	219	26	28	35	152	137	242	946
MO	*Tellina modesta*	69	52	39	161	69	45	26	71	230	762
AN	*Spiophanes bombyx*	55	32	56	391	48	11	23	58	58	732
EC	*Dendraster excentricus*	21	278	7	1	73	20	65	30	132	627
MO	*Solen sicarius*	-	-	13	7	5	171	13	255	-	464
AR	*Rhepoxynius menziesi*	58	31	40	47	1	23	75	70	81	426
AR	*Mandibulophoxus gilesi*	94	107	4	81	-	-	-	29	89	404
AN	*Hesionura coineaui difficilis*	2	366	-	-	-	-	7	-	5	380
AN	*Mediomastus* spp	31	61	149	70	-	5	2	7	33	358
AR	*Rhepoxynius abronius*	77	28	44	95	4	-	2	6	102	358
AR	*Aoroides inermis*	-	-	-	-	-	21	152	142	9	324
NE	*Carinoma mutabilis*	31	81	20	56	29	8	22	21	35	303
AN	*Owenia collaris*	9	10	8	7	103	17	30	108	10	302
AN	*Polydora cirrosa*	-	-	-	15	36	90	7	151	-	299
AN	*Mediomastus acutus*	-	-	-	-	123	36	12	61	53	285
AR	*Gibberosus devaneyi*	-	5	12	239	4	-	-	-	12	272
AN	*Chaetozone setosa* Cmplx	20	42	3	82	14	21	16	27	12	237
AR	*Gibberosus myersi*	54	8	18	8	26	14	12	28	42	210
AN	*Spiochaetopterus costarum*	17	2	43	42	34	-	-	19	24	181
MO	*Cooperella subdiaphana*	-	8	4	8	23	36	2	57	21	159
AR	*Hartmanodes hartmanae*	35	1	49	8	27	15	5	2	13	155
AN	*Prionospio (Minuspio) lighti*	2	-	14	13	45	-	1	2	63	140
AR	*Americhelidium shoemakeri*	14	9	8	9	2	-	13	26	56	137
CO	Enteropneusta	8	45	16	19	13	10	4	11	11	137
AN	*Spiophanes duplex*	12	6	39	18	14	7	9	3	26	134
AR	*Rudilemboides stenopropodus*	45	3	-	40	-	-	1	-	42	131
AN	*Nephtys caecoides*	10	4	17	26	2	5	20	13	27	124
NE	*Tubulanus polymorphus*	-	19	28	21	22	1	1	18	13	123
AR	*Ericthonius brasiliensis*	3	-	-	1	-	10	12	94	1	121
AN	*Goniada littorea*	7	19	11	11	22	4	23	17	4	118
AN	*Monticellina cryptica*	-	3	3	10	9	6	24	54	6	115
AR	*Ampelisca agassizi*	9	5	10	20	-	-	1	4	60	109
AN	*Scoloplos armiger* Cmplx	9	33	20	17	4	-	4	14	4	105
AN	*Paraprionospio pinnata*	7	31	30	15	6	7	-	3	4	103
AN	*Protodorvillea gracilis*	66	13	-	-	-	-	1	-	21	101
AN	*Microphthalmus hystrix*	-	93	-	-	-	-	-	-	-	93
AN	*Pectinaria californiensis*	-	-	2	20	11	8	4	4	41	90
NT	Nematoda	1	8	4	7	24	4	12	23	7	90
NE	*Paranemertes californica*	6	9	10	20	24	3	2	9	5	88
AR	*Jassa slatteryi*	1	-	1	-	-	-	7	-	73	82
AN	*Nephtys cornuta*	3	4	8	45	2	-	1	5	12	80
AN	*Magelona pitelkai*	40	28	2	-	5	-	-	-	4	79
MO	*Crepidula naticarum*	-	-	-	15	4	12	3	42	-	76
AR	*Acuminodeutopus heteruropus*	-	3	5	54	2	-	-	1	9	74
AR	*Argissa hamatipes*	1	-	10	5	16	-	-	4	38	74
AR	*Campylaspis* sp C Myers & Benedict 1974	7	1	6	11	4	-	15	3	27	74
EN	Loxosomatidae	-	-	-	-	73	-	-	-	-	73
AR	*Hemilamprops californicus*	6	2	23	8	4	5	9	4	9	70
AN	*Aricidea (Acmira) catherinae*	6	18	10	5	4	1	2	13	8	67
AR	*Photis brevipes*	8	-	-	15	-	1	22	15	6	67
AN	*Armandia brevis*		-	-	4	1	34	-	7	20	66
AN	*Exogone lourei*	5	23	4	-	29	-	-	5	-	66
NE	Nemertea	8	12	11	9	9	-	2	6	9	66
MO	*Solamen columbianum*	-	-	-	-	-	-	21	-	40	61
AN	*Levinsenia gracilis*	2	-	33	2	-	-	23	-	-	60
AR	*Photis* sp OC1 Diener 1992	-	-	-	-	-	-	31	11	18	60
AN	*Sigalion spinosus*	6	6	13	5	3	5	10	8	3	59
AN	*Leitoscoloplos pugettensis*	-	9	-	21	11	3	9	1	1	55
CN	*Zaolutus actius*	-	2	-	2	37	-	9	5	-	55
MO	*Olivella baetica*	9	2	3	19	5	5	-	5	6	54
AN	*Ampharete labrops*	4	-	-	13	1	1	20	10	4	53
PR	Phorona	1	2	24	2	18	2	-	2	2	53
MO	*Macoma* sp	-	4	4	5	3	-	2	18	14	50
NE	Lineidae	3	5	-	5	10	4	-	13	10	50
AN	*Onuphis eremita parva*	10	3	8	1	12	-	-	6	9	49
AN	*Syllis (Typosyllis)* sp	26	4	-	-	18	1	-	-	-	49
AR	*Leptocuma forsmani*	1	1	8	2	2	2	26	2	5	49
AR	*Uromunna ubiquita*	-	-	7	3	16	6	8	7	2	49
AN	*Nereis latescens*	-	-	-	-	-	-	9	33	5	47
AR	*Lamprops quadriplicatus*	-	2	10	5	-	1	2	9	17	46
AN	*Glycera macrobranchia*	4	2	4	3	21	3	1	2	5	45
AN	*Lumbrineris* spp	16	15	14	-	-	-	-	-	-	45
AN	*Lumbrineris californiensis*	-	2	2	37	1	-	1	-	-	43
AN	*Syllis (Typosyllis) farallonesis*	-	-	-	4	-	-	4	18	17	43
MO	*Siliqua lucida*	-	-	6	1	-	10	6	20	-	43
AR	*Photis bifurcata*	-	-	-	1	6	1	14	16	-	38
AN	*Syllis aciculata*	-	16	19	-	-	-	-	-	-	35

Appendix G-5. (Cont.).

Phylum	Species	1991	1992	1993	1994	1997	1998*	1999	2000	2001	Total
		Year									
AN	*Brania californiensis*	-	-	-	-	5	2	1	26	-	34
AR	*Balanus pacificus*	-	-	-	-	5	4	-	23	-	32
MO	*Tresus nuttallii*	-	-	-	-	-	32	-	-	-	32
EC	Amphiuridae	9	1	4	2	-	-	9	-	6	31
AR	*Foxiphalus obtusidens*	-	-	-	2	-	-	4	12	12	30
AN	*Anotomastus gordiodes*	1	-	15	13	-	-	-	-	-	29
AN	*Cirriformia spirabrancha*	-	4	-	4	-	3	12	6	-	29
AR	*Cyclaspis* sp C SCAMIT 1986	7	1	11	1	8	-	-	1	-	29
PL	*Stylochoplana* sp	1	4	3	8	-	1	-	6	6	29
AN	*Magelona sacculata*	21	5	-	-	-	-	-	-	2	28
MO	Mytilidae	-	-	-	1	-	-	-	27	-	28
AN	*Aonides* sp	-	-	-	-	-	-	-	-	27	27
AR	*Neotrypaea californiensis*	1	2	1	2	11	-	1	3	6	27
AN	*Amaeana occidentalis*	-	-	4	14	-	4	-	4	-	26
AN	*Scoletoma tetraura* Cmplx	6	2	5	1	10	-	2	-	-	26
AN	*Aphelochaeta glandaria*	-	-	-	-	6	6	5	4	4	25
MO	*Sulcoretusa xystrum*	7	6	7	5	-	-	-	-	-	25
AN	*Hesionella mccullochae*	-	-	2	-	9	1	-	6	5	23
MO	*Rochefortia tumida*	2	1	5	1	2	2	-	2	8	23
AN	Eusyllis sp	-	-	-	2	-	-	-	20	-	22
AR	*Ancinus granulatus*	2	2	-	1	1	1	2	7	6	22
AR	*Edotia sublittoralis*	-	-	5	1	2	1	4	2	7	22
AR	*Ampelisca cristata cristata*	13	3	-	1	-	-	-	-	3	20
AR	*Anchicolurus occidentalis*	3	2	7	-	-	-	3	4	1	20
AN	*Nereis procera*	3	1	5	3	3	-	-	4	-	19
AN	*Podarkeopsis glabra*	4	3	2	-	3	1	-	1	5	19
AR	*Leptochelia dubia*	-	-	-	12	2	-	-	5	-	19
AR	*Oxyurostylis pacifica*	4	4	-	4	-	-	-	-	6	18
MO	*Caecum crebricinctum*	-	-	-	-	-	-	5	-	13	18
PL	*Pseudoceros* sp	-	-	-	-	-	16	-	2	-	18
AN	*Axiothella rubrocinata*	1	-	-	5	-	-	-	11	-	17
AR	*Cerapus tubularis* Cmplx	-	-	7	3	2	2	-	3	-	17
MO	*Leptopecten latiauratus*	-	-	-	3	-	-	2	11	1	17
AR	*Pachynus barnardi*	1	2	4	7	1	-	-	-	1	16
AR	*Photis macinerneyi*	-	-	11	3	1	-	-	-	1	16
EC	*Amphiodia digitata*	-	3	2	1	-	7	-	-	3	16
MO	*Crepidula* sp	16	-	-	-	-	-	-	-	-	16
MO	*Macoma secta*	-	-	-	-	-	8	-	-	8	16
MO	*Rictaxis punctocaelatus*	1	1	-	-	1	1	4	2	6	16
AN	Maldanidae	-	-	-	-	4	-	-	2	9	15
AN	*Phyllochaetopterus prolifica*	-	-	-	-	-	14	-	1	-	15
AR	*Amphideutopus oculatus*	2	-	1	10	1	-	-	-	1	15
AR	*Leuroleberis sharpei*	-	-	2	2	1	-	1	1	8	15
MO	*Modiolus* sp	-	-	1	3	2	2	2	5	-	15
MO	*Polygireulima rutila*	-	-	14	1	-	-	-	-	-	15
AN	*Dipolydora socialis*	2	1	9	-	-	-	-	-	2	14
AN	*Dispio uncinata*	5	2	2	2	-	-	2	1	-	14
AN	*Phyllodoce hartmanae*	1	-	1	3	1	1	-	2	5	14
AR	*Isocheles pilosus*	1	-	1	9	-	-	-	1	2	14
EC	*Amphiodia* sp	-	-	1	-	10	-	2	1	-	14
NE	Micrura alaskensis	12	-	-	2	-	-	-	-	-	14
AR	*Anoropallene palpida*	5	1	3	1	1	1	1	-	-	13
AR	*Stenothoe estacola*	-	-	-	-	-	-	4	-	9	13
AR	*Tiburonella viscana*	13	-	-	-	-	-	-	-	-	13
MO	*Mysella* sp H SCAMIT 2001	-	-	-	12	-	1	-	-	-	13
AN	*Chone albocincta*	-	-	1	3	7	-	1	-	-	12
AN	*Onuphis* sp 1 Pt. Loma 1983	-	1	1	6	2	-	1	-	1	12
AN	*Platynereis bicanaliculata*	-	-	-	3	-	-	1	8	-	12
AN	*Polycirrus* sp	4	-	-	2	-	-	-	-	6	12
AR	*Aoroides* sp	4	-	-	5	3	-	-	-	-	12
AR	*Lepidopa californica*	2	1	2	3	-	-	-	1	3	12
AR	*Postasterope barnesi*	3	1	5	1	2	-	-	-	-	12
MO	*Acteocina culcitella*	-	-	-	2	1	-	-	1	8	12
MO	*Kurtziella plumbea*	1	1	1	-	3	3	-	1	2	12
MO	*Macoma nasuta*	2	-	-	-	-	2	-	1	7	12
NE	*Carinomella lactea*	12	-	-	-	-	-	-	-	-	12
NE	*Micrura* sp	-	3	-	-	-	-	8	-	1	12
AN	*"Tharyx"* spp	6	2	3	-	-	-	-	-	-	11
AN	*Diopatra ornata*	-	-	1	-	-	-	9	-	1	11
AN	*Glycera nana*	1	-	1	-	-	-	-	-	9	11
AN	*Neosabellaria cementarium*	-	-	-	-	-	-	-	11	-	11
AN	*Tenonia priops*	1	2	-	-	3	1	-	2	2	11
AR	*Hippomedon zetesimus*	11	-	-	-	-	-	-	-	-	11
BC	*Glottidia albida*	1	3	3	-	1	-	-	2	1	11
EC	*Amphiura arcystata*	9	1	1	-	-	-	-	-	-	11
MO	*Mactromeris catilliformis*	-	-	-	-	-	-	-	-	11	11
MO	*Mactrotoma californica*	-	-	-	-	-	11	-	-	-	11
NE	*Tetrastemma* sp	-	1	-	4	3	-	2	1	-	11
AN	*Cirriformia moorei*	-	-	-	-	-	-	-	2	8	10

Appendix G-5. (Cont.).

Phylum	Species	1991	1992	1993	1994	1997	1998*	1999	2000	2001	Total
		Year									
CO	*Branchiostoma californiense*	2	-	-	-	3	-	1	-	4	10
MO	*Protothaca staminea*	-	-	-	1	-	-	-	7	2	10
MO	*Rochefortia compressa*	2	-	7	-	1	-	-	-	-	10
MO	*Turbonilla santarosana*	-	1	-	-	1	-	1	4	3	10
PR	*Phoronis* sp	-	-	-	-	-	-	-	7	3	10
AN	Euclymeninae sp A of SCAMIT 1987	-	-	1	5	-	-	-	-	3	9
AN	*Eudistylia vancouveri*	-	-	-	-	-	1	1	7	-	9
AN	*Poecilochaetus johnsoni*	-	-	-	5	2	-	-	-	2	9
AR	Harpacticoida	-	1	-	5	-	1	-	-	2	9
AR	*Ischyrocerus pelagops*	-	-	-	-	-	-	2	7	-	9
AR	*Parasterope hulingsi*	-	-	-	-	-	-	1	4	4	9
CN	Actiniaria	3	1	-	1	-	1	-	-	3	9
EC	*Leptosynapta* sp	-	2	-	1	-	-	-	1	5	9
MO	Bivalvia	-	-	2	-	3	2	1	-	1	9
MO	*Macoma indentata*	-	-	-	-	1	-	1	-	7	9
AN	*Diopatra splendidissima*	-	-	-	6	-	-	-	2	-	8
AN	*Glycinde armigera*	-	5	1	-	1	-	1	-	-	8
AN	*Paleanotus bellis*	-	-	-	-	1	-	-	7	-	8
AN	*Sabellaria gracilis*	-	-	-	-	-	-	8	-	-	8
AN	*Sige* sp A SCAMIT 1995	4	-	-	4	-	-	-	-	-	8
AR	*Euphilomedes carcharodonta*	-	-	-	-	-	-	-	5	3	8
AR	*Gammaropsis thompsoni*	1	-	-	5	-	-	-	2	-	8
AR	*Metamysidopsis elongata*	-	-	1	-	-	3	3	1	-	8
AR	*Pyromaia tuberculata*	1	-	-	-	1	1	3	2	-	8
AR	*Rhepoxynius stenodes*	2	-	-	5	-	1	-	-	-	8
CN	Limnactiniidae sp A SCAMIT 1989	2	1	1	-	1	1	-	1	1	8
MO	*Epitonium sawinae*	-	-	-	1	5	-	-	-	2	8
MO	*Neverita reclusiana*	-	1	-	3	-	-	1	1	2	8
PL	*Imogine exiguus*	-	-	-	1	7	-	-	-	-	8
AN	*Caulleriella alata*	-	-	-	-	-	-	-	-	7	7
AN	*Chone* sp SD 1 Pt. Loma 1997	-	-	-	-	-	-	3	2	2	7
AN	*Phyllodoce longipes*	-	-	-	2	-	-	-	1	4	7
AR	*Blepharipoda occidentalis*	-	-	3	2	-	-	-	2	-	7
AR	*Cancer* sp	-	-	-	1	-	-	1	4	1	7
AR	*Caprella mendax*	-	-	-	-	-	1	6	-	-	7
AR	*Mysidopsis intii*	-	-	-	-	3	1	-	1	2	7
AR	*Photis californica*	-	1	-	2	4	-	-	-	-	7
AR	*Pinnixa longipes*	-	-	-	3	1	-	-	-	3	7
MO	*Balcis oldroydae*	1	-	4	2	-	-	-	-	-	7
MO	*Ensis myrae*	-	-	-	-	-	-	-	5	2	7
MO	*Nassarius perpinguis*	-	-	-	2	1	-	-	3	1	7
MO	*Turbonilla* sp	2	3	-	-	2	-	-	-	-	7
MO	*Volvulella cylindrica*	3	2	2	-	-	-	-	-	-	7
NE	Hoplonemertea sp A Paquette 1988	-	-	3	2	-	-	2	-	-	7
AN	*Ancistrosyllis hamata*	-	-	1	-	2	-	-	3	-	6
AN	Aricidea (Aricidea) wassi	-	1	4	-	1	-	-	-	-	6
AN	*Chaetozone corona*	1	1	-	-	-	-	1	2	1	6
AN	*Euchone incolor*	-	-	-	4	2	-	-	-	-	6
AN	*Goniada maculata*	-	-	-	1	2	-	2	-	1	6
AN	Lumbrineridae	-	-	-	-	4	1	-	1	-	6
AN	*Micropodarke dubia*	-	-	-	2	-	-	1	-	3	6
AN	*Pista disjuncta*	3	-	-	3	-	-	-	-	-	6
AN	*Spiophanes berkeleyorum*	-	-	-	-	-	-	-	1	5	6
AN	*Sthenelais verruculosa*	-	-	-	1	-	-	4	-	1	6
AR	*Aoroides intermedius*	-	-	-	6	-	-	-	-	-	6
AR	*Cumella californica*	2	1	-	2	-	-	-	-	1	6
AR	*Elasmopus holgurus*	-	-	-	-	-	-	-	-	6	6
AR	*Liriopsis pygmaea*	-	-	-	6	-	-	-	-	-	6
AR	*Listriella melanica*	-	-	4	1	-	-	1	-	-	6
AR	*Metharpinia coronadoi*	-	-	-	-	-	-	-	-	6	6
MO	*Rochefortia grippi*	-	-	-	-	-	-	-	1	5	6
NE	*Cerebratulus californiensis*	1	-	-	2	2	-	1	-	-	6
AN	*Capitella capitata* Cmplx	-	-	-	-	-	1	-	-	4	5
AN	*Cossura candida*	-	-	3	2	-	-	-	-	-	5
AN	*Eumida longicornuta*	-	-	-	2	1	-	1	1	-	5
AN	*Eusyllis transecta*	-	-	-	-	-	2	-	-	3	5
AN	*Saccocirrus* sp	-	4	-	-	-	-	1	-	-	5
AR	*Aoroides exilis*	-	-	-	-	-	-	2	3	-	5
AR	Gammaridea	3	-	-	2	-	-	-	-	-	5
AR	*Ogyrides* sp A of Roney 1978	-	2	3	-	-	-	-	-	-	5
AR	*Rhepoxynius* sp A SCAMIT 1987	-	-	-	3	1	-	-	1	-	5
CN	Pennatulacea	-	-	-	1	3	-	-	-	1	5
EC	*Amphiodia psara*	3	-	-	-	-	-	2	-	-	5
MO	*Acteocina harpa*	-	-	-	1	2	-	-	-	2	5
MO	*Crepidula norrisiarum*	-	-	-	-	-	-	1	-	4	5
MO	*Cyclostremella dalli*	-	-	-	-	3	-	-	2	-	5
MO	*Halistylus pupoideus*	-	-	-	-	-	-	-	-	5	5
MO	*Macoma yoldiformis*	-	-	-	2	-	1	-	-	2	5
MO	*Odostomia* sp D MBC 1980	1	-	3	1	-	-	-	-	-	5

Appendix G-5. (Cont.).

Phylum	Species	Year 1991	1992	1993	1994	1997	1998*	1999	2000	2001	Total
MO	*Turbonilla almo*	-	-	1	-	1	-	-	-	3	5
NE	*Tetrastemma* sp A SCAMIT 1995	-	-	-	-	-	3	1	-	1	5
AN	*Amphicteis scaphobranchiata*	-	1	-	2	-	-	-	1	-	4
AN	*Chaetopterus variopedatus* Cmplx	2	-	-	1	1	-	-	-	-	4
AN	*Chone* sp C Harris 1984	-	-	-	-	3	-	-	1	-	4
AN	*Cirriformia tentaculata*	-	-	-	-	4	-	-	-	-	4
AN	*Diopatra tridentata*	2	-	-	-	-	1	-	1	-	4
AN	Euclymeninae	2	2	-	-	-	-	-	-	-	4
AN	*Malmgreniella macginitiei*	-	-	1	-	-	-	-	3	-	4
AN	Onuphidae	-	-	-	-	1	2	-	1	-	4
AN	*Paraonella platybranchia*	-	1	2	1	-	-	-	-	-	4
AN	*Phyllodoce pettiboneae*	-	-	-	-	4	-	-	-	-	4
AN	*Phyllodoce* sp	-	-	-	1	2	-	-	-	1	4
AN	*Polydora limicola*	-	-	2	1	1	-	-	-	-	4
AN	*Syllis (Ehlersia) heterochaeta*	-	-	-	1	1	2	-	-	-	4
AR	*Nebalia pugettensis* Cmplx	2	-	2	-	-	-	-	-	-	4
AR	*Photis* sp	4	-	-	-	-	-	-	-	-	4
AR	*Pinnixa forficulimanus*	1	1	-	-	1	-	1	-	-	4
AR	*Pleusymtes subglaber*	-	-	-	-	-	-	-	2	2	4
MO	*Cumingia californica*	-	-	-	-	-	2	2	-	-	4
MO	*Nassarius fossatus*	4	-	-	-	-	-	-	-	-	4
MO	*Parvilucina tenuisculpta*	1	-	1	-	2	-	-	-	-	4
MO	*Philine bakeri*	-	-	-	-	4	-	-	-	-	4
SI	*Thysanocardia nigra*	-	-	-	-	2	-	-	2	-	4
AN	*Aricidea (Acmira) horikoshii*	-	1	-	1	-	-	1	-	-	3
AN	*Cirriformia* sp	3	-	-	-	-	-	-	-	-	3
AN	*Eranno lagunae*	-	-	-	-	-	-	-	-	3	3
AN	*Glycera* sp	1	1	-	-	-	1	-	-	-	3
AN	Heteropodarke heteromorpha	3	-	-	-	-	-	-	-	-	3
AN	*Magelona californica*	-	-	-	-	-	-	-	3	-	3
AN	Nereididae	-	-	-	-	-	-	-	3	-	3
AN	*Nereiphylla castanea*	-	-	-	-	-	-	-	1	2	3
AN	*Parandalia fauveli*	-	-	-	-	1	-	-	-	2	3
AN	*Polycirrus californicus*	-	-	-	2	-	-	1	-	-	3
AN	*Polydora bioccipitalis*	-	-	-	-	-	1	-	-	2	3
AN	*Prionospio (Prionospio) jubata*	-	-	2	-	-	-	-	-	1	3
AN	Syllidae	-	-	2	-	-	-	1	-	-	3
AN	Terebellidae	-	3	-	-	-	-	-	-	-	3
AR	*Americhelidium rectipalmum*	-	-	-	-	-	-	-	-	3	3
AR	*Ampelisca brevisimulata*	-	-	1	2	-	-	-	-	-	3
AR	*Caprella californica*	-	-	1	-	-	-	-	2	-	3
AR	*Eurydice caudata*	1	2	-	-	-	-	-	-	-	3
AR	*Laticorophium baconi*	-	-	1	-	-	-	2	-	-	3
AR	*Nebalia daytoni*	-	-	-	1	-	-	-	-	2	3
AR	*Paramicrodeutopus schmitti*	-	-	-	-	-	-	1	-	2	3
AR	*Photis* sp B Paquette 1987	3	-	-	-	-	-	-	-	-	3
AR	*Rhepoxynius* sp	1	2	-	-	-	-	-	-	-	3
CN	*Edwardsia* sp G MEC 1992	1	-	1	-	-	-	-	-	1	3
EC	*Astropecten verrilli*	-	-	-	-	-	-	2	-	1	3
EC	Ophiuroidea	-	1	-	1	-	-	-	1	-	3
MO	*Doto amyra*	-	1	-	-	2	-	-	-	-	3
MO	*Ophiodermella cancellata*	-	1	2	-	-	-	-	-	-	3
MO	*Rochefortia coani*	-	-	1	-	-	-	-	2	-	3
MO	*Volvulella californica*	-	-	-	3	-	-	-	-	-	3
NE	*Lineus* sp	-	-	-	-	-	-	-	3	-	3
NE	*Tubulanus cingulatus*	-	-	1	-	2	-	-	-	-	3
NE	*Tubulanus nothus*	1	1	1	-	-	-	-	-	-	3
SI	Sipuncula	-	1	-	-	-	-	2	-	-	3
AN	*Arabella endonata*	-	-	-	-	1	-	1	-	-	2
AN	*Chone mollis*	-	-	-	-	-	-	-	1	1	2
AN	*Chone veleronis*	-	-	-	1	-	-	-	1	-	2
AN	*Cirrophorus furcatus*	-	-	-	1	1	-	-	-	-	2
AN	*Diopatra* sp	-	-	-	-	-	2	-	-	-	2
AN	*Eteone fauchaldi*	-	-	1	-	-	-	-	-	1	2
AN	*Eulalia californiensis*	-	-	-	-	-	-	-	2	-	2
AN	*Nephtys californiensis*	-	-	-	-	-	-	-	-	2	2
AN	*Notomastus tenuis*	-	-	-	-	-	-	-	2	-	2
AN	*Onuphis eremita*	-	-	2	-	-	-	-	-	-	2
AN	*Pherusa neopapillata*	-	-	-	-	-	-	-	1	1	2
AN	Phyllodocidae	-	-	-	-	2	-	-	-	-	2
AN	*Polydora* sp	-	-	-	-	-	-	-	-	2	2
AN	*Polydora websteri*	-	-	-	-	-	-	-	2	-	2
AN	*Polyophthalmus pictus*	-	-	-	2	-	-	-	-	-	2
AN	*Schistocomus* sp A SCAMIT 1987	-	-	-	-	-	-	-	2	-	2
AN	*Scoloplos acmeceps*	-	-	-	-	-	-	-	-	2	2
AN	*Sphaerosyllis californiensis*	-	-	-	-	-	-	-	2	-	2
AR	*Ammothea hilgendorfi*	-	-	-	-	-	-	-	-	2	2
AR	Brachyura (megalopa)	-	1	-	1	-	-	-	-	-	2
AR	*Caprella verrucosa*	-	-	-	-	-	-	2	-	-	2

Appendix G-5. (Cont.).

Phylum	Species	1991	1992	1993	1994	1997	1998*	1999	2000	2001	Total
		Year									
AR	*Clausidium vancouverense*	2	-	-	-	-	-	-	-	-	2
AR	*Cyclaspis* sp B SCAMIT 1989	-	-	-	-	-	-	-	2	-	2
AR	*Hornellia occidentalis*	-	-	1	-	-	-	-	-	1	2
AR	*Incisocalliope bairdi*	-	-	-	-	-	-	2	-	-	2
AR	*Incisocalliope newportensis*	-	-	1	1	-	-	-	-	-	2
AR	*Leptostylis* sp	1	-	-	1	-	-	-	-	-	2
AR	Majidae	-	-	-	2	-	-	-	-	-	2
AR	*Melphisana bola* Cmplx	-	-	-	1	-	-	-	-	1	2
AR	*Neomysis kadiakensis*	-	-	-	1	-	-	-	-	1	2
AR	Paguridea	1	-	-	-	1	-	-	-	-	2
AR	*Pinnixa* sp	-	-	-	-	-	-	-	2	-	2
AR	*Zeugophilomedes oblongatus*	-	-	-	-	-	-	-	-	2	2
AR	*Zeuxo normani*	-	-	2	-	-	-	-	-	-	2
CN	*Clytia universitatis*	-	-	-	-	2	-	-	-	-	2
CN	Edwardsiidae	-	1	-	-	1	-	-	-	-	2
CN	*Plumularia corrugata*	-	-	-	-	-	-	1	1	-	2
CN	*Tubularia* sp	-	-	-	-	-	-	2	-	-	2
EC	*Astropecten armatus*	-	-	1	-	1	-	-	-	-	2
EC	*Lovenia cordiformis*	-	-	-	1	1	-	-	-	-	2
EC	*Ophiactis simplex*	-	2	-	-	-	-	-	-	-	2
MO	*Aglaja ocelligera*	1	-	-	-	-	-	-	1	-	2
MO	*Armina californica*	-	-	1	-	1	-	-	-	-	2
MO	*Cadulus aberrans*	-	-	-	-	-	1	-	1	-	2
MO	*Chione californica*	2	-	-	-	-	-	-	-	-	2
MO	*Cylichna diegensis*	1	-	-	-	-	-	-	1	-	2
MO	*Ennucula tenuis*	-	-	-	-	-	-	-	-	2	2
MO	*Melanochlamys diomedea*	-	1	-	1	-	-	-	-	-	2
MO	*Mytilus galloprovincialis*	-	-	-	-	-	-	1	-	1	2
MO	*Odostomia* sp	-	-	-	-	2	-	-	-	-	2
MO	Onchidorididae	-	-	-	-	-	-	-	2	-	2
MO	*Saxidomus nuttalli*	-	-	-	1	1	-	-	-	-	2
MO	*Semele* sp	-	-	-	-	2	-	-	-	-	2
MO	*Tellina bodegensis*	-	1	-	-	-	-	-	-	1	2
MO	*Turbonilla painei*	-	-	1	-	-	1	-	-	-	2
MO	*Turbonilla pedroana*	-	-	-	1	1	-	-	-	-	2
MO	*Turbonilla raymondi*	-	-	-	-	2	-	-	-	-	2
NE	*Amphiporus* sp	-	-	-	1	-	-	-	1	-	2
NE	*Cerebratulus* sp	-	-	-	-	-	-	-	2	-	2
NE	Hoplonemertea	-	-	2	-	-	-	-	-	-	2
PL	*Plehnia caeca*	-	1	-	-	-	-	-	-	1	2
SI	*Siphonosoma ingens*	-	-	-	-	-	-	-	1	1	2
SI	*Sipunculus nudus*	-	2	-	-	-	-	-	-	-	2
AN	*Amphitrite robusta*	-	-	-	-	-	-	1	-	-	1
AN	*Ancistrosyllis groenlandica*	-	1	-	-	-	-	-	-	-	1
AN	*Arabella semimaculata*	-	-	-	-	-	-	-	1	-	1
AN	*Caulleriella bioculata*	-	-	-	-	-	-	-	1	-	1
AN	*Chaetozone* sp	-	-	-	-	-	-	1	-	-	1
AN	*Chloeia pinnata*	-	-	-	-	-	-	1	-	-	1
AN	*Cirratulus cirratus*	-	-	-	-	-	-	-	1	-	1
AN	*Cossura* sp A Phillips 1987	-	-	-	-	1	-	-	-	-	1
AN	*Dorvillea longicornis*	-	-	-	1	-	-	-	-	-	1
AN	*Drilonereis longa*	-	-	-	-	1	-	-	-	-	1
AN	*Eteone californica*	-	-	-	-	-	-	-	-	1	1
AN	*Euchone arenae*	-	-	-	-	-	-	-	-	1	1
AN	*Eulalia quadrioculata*	-	-	-	-	-	-	1	-	-	1
AN	*Glycera americana*	-	1	-	-	-	-	-	-	-	1
AN	Hesionidae	1	-	-	-	-	-	-	-	-	1
AN	*Loimia* sp A SCAMIT 2001	-	-	-	-	-	-	1	-	-	1
AN	*Lumbrineris japonica*	-	-	-	-	-	-	-	-	1	1
AN	*Magelona hartmanae*	-	-	-	-	-	-	-	-	1	1
AN	*Megalomma pigmentum*	-	-	-	-	-	1	-	-	-	1
AN	*Mesochaetopterus taylori*	1	-	-	-	-	-	-	-	-	1
AN	*Metasychis disparidentatus*	-	-	-	-	1	-	-	-	-	1
AN	*Neanthes* sp	-	-	1	-	-	-	-	-	-	1
AN	*Odontosyllis phosphorea*	-	-	-	1	-	-	-	-	-	1
AN	Oligochaeta	-	-	-	-	-	-	-	-	1	1
AN	*Ophelia limacina*	1	-	-	-	-	-	-	-	-	1
AN	Opheliidae	-	1	-	-	-	-	-	-	-	1
AN	*Paranaitis polynoides*	-	-	-	-	-	-	-	-	1	1
AN	*Phyllochaetopterus limicolus*	-	-	-	-	-	-	-	1	-	1
AN	*Pisione remota*	-	1	-	-	-	-	-	-	-	1
AN	*Polydora cornuta*	-	-	-	-	-	-	-	-	1	1
AN	*Praxillella pacifica*	-	-	1	-	-	-	-	-	-	1
AN	*Proceraea* sp	-	-	-	-	-	-	-	-	1	1
AN	*Pseudopotamilla occelata*	1	-	-	-	-	-	-	-	-	1
AN	Sabellidae	-	1	-	-	-	-	-	-	-	1
AN	*Sphaerephesia similisetis*	-	-	-	-	-	-	-	1	-	1
AN	*Sthenelais tertiaglabra*	-	-	-	-	-	-	1	-	-	1
AN	*Subadyte mexicana*	-	-	-	-	1	-	-	-	-	1

Appendix G-5. (Cont.).

Phylum	Species	Year 1991	1992	1993	1994	1997	1998*	1999	2000	2001	Total
AN	*Travisia gigas*	-	-	-	-	-	-	-	1	-	1
AR	*Alpheus bellimanus*	-	-	-	1	-	-	-	-	-	1
AR	*Ampelisca brachycladus*	-	-	-	-	-	-	-	-	1	1
AR	*Balanus* sp	1	-	-	-	-	-	-	-	-	1
AR	Brachyura	-	-	-	-	-	-	1	-	-	1
AR	*Cancer antennarius*	-	-	-	-	-	-	-	1	-	1
AR	*Clythrocerus planus*	1	-	-	-	-	-	-	-	-	1
AR	*Cyclaspis nubila*	1	-	-	-	-	-	-	-	-	1
AR	*Dynamenella dianae*	-	-	-	-	-	-	-	1	-	1
AR	*Elasmopus bampo*	-	-	1	-	-	-	-	-	-	1
AR	*Euphilomedes longiseta*	-	-	1	-	-	-	-	-	-	1
AR	*Eusarsiella thominx*	-	-	-	-	-	-	1	-	-	1
AR	*Grandidierella japonica*	-	-	-	-	-	-	-	1	-	1
AR	Janiridae	-	-	-	-	-	-	-	-	1	1
AR	*Listriella diffusa*	-	-	-	1	-	-	-	-	-	1
AR	*Listriella eriopisa*	-	-	-	-	-	1	-	-	-	1
AR	*Metatiron tropakis*	-	-	-	-	-	-	-	-	1	1
AR	*Monocorophium* sp	-	-	-	-	-	-	-	-	1	1
AR	Oedicerotidae	-	-	-	-	-	-	-	-	1	1
AR	*Orchomene anaquelus*	-	-	-	1	-	-	-	-	-	1
AR	*Paguristes* sp	-	-	-	-	-	-	-	-	1	1
AR	*Paracerceis sculpta*	-	-	1	-	-	-	-	-	-	1
AR	*Parapagurodes* sp	-	-	-	-	-	1	-	-	-	1
AR	Pinnotheridae	-	-	1	-	-	-	-	-	-	1
AR	*Pontogeneia rostrata*	-	-	-	-	-	-	1	-	-	1
AR	Porcellanidae	-	1	-	-	-	-	-	-	-	1
AR	Pycnogonida	-	-	-	-	1	-	-	-	-	1
AR	Sphaeromatidae	-	-	-	-	-	-	-	-	1	1
AR	*Stenothoides bicoma*	-	-	-	-	-	-	1	-	-	1
AR	*Tanystylum californicum*	-	-	-	-	-	-	1	-	-	1
AR	*Tiron biocellata*	-	-	-	-	-	-	-	1	-	1
CN	*Euphysa* sp A Hochberg & Ljubenkov 1998	-	-	-	1	-	-	-	-	-	1
CN	*Halcampa decemtentaculata*	-	-	1	-	-	-	-	-	-	1
CN	*Renilla kollikeri*	-	-	1	-	-	-	-	-	-	1
CN	*Rhizocaulus verticillatus*	-	-	-	-	-	-	1	-	-	1
CN	*Scolanthus* sp A SCAMIT 1983	-	-	-	-	-	-	-	-	1	1
CO	Ascidiacea	-	-	-	-	-	-	-	-	1	1
EC	*Amphioplus* sp LA1 Cadien 1998	-	-	1	-	-	-	-	-	-	1
EC	Asteroidea	-	-	-	-	1	-	-	-	-	1
EC	*Astropecten* sp	1	-	-	-	-	-	-	-	-	1
EC	*Ophiuroconis bispinosa*	-	-	1	-	-	-	-	-	-	1
EP	*Bowerbankia gracilis*	-	1	-	-	-	-	-	-	-	1
MO	*Aeolidia papillosa*	-	-	-	-	-	-	-	1	-	1
MO	*Caecum* sp	1	-	-	-	-	-	-	-	-	1
MO	*Collisella ochracea*	-	-	1	-	-	-	-	-	-	1
MO	*Cylichnella harpa*	-	-	1	-	-	-	-	-	-	1
MO	*Cylichnella inculta*	-	-	1	-	-	-	-	-	-	1
MO	*Epitonium bellastriatum*	-	-	1	-	-	-	-	-	-	1
MO	Gastropoda	-	1	-	-	-	-	-	-	-	1
MO	*Leporimetis obesa*	-	-	-	-	-	-	-	-	1	1
MO	*Lyonsia californica*	-	-	-	-	-	-	-	1	-	1
MO	Mactridae	-	-	-	-	-	-	1	-	-	1
MO	*Mysella* sp	1	-	-	-	-	-	-	-	-	1
MO	*Mysella* sp C SCAMIT 1988	-	-	-	-	1	-	-	-	-	1
MO	*Nuculana taphria*	-	-	-	1	-	-	-	-	-	1
MO	Nudibranchia	1	-	-	-	-	-	-	-	-	1
MO	*Periploma discus*	-	-	-	-	-	-	-	-	1	1
MO	*Solen rosaceus*	1	-	-	-	-	-	-	-	-	1
MO	*Solen* sp	1	-	-	-	-	-	-	-	-	1
MO	*Tellina idae*	1	-	-	-	-	-	-	-	-	1
MO	*Turbonilla* sp D MBC 1971	-	-	1	-	-	-	-	-	-	1
MO	*Yoldia cooperi*	-	-	-	-	-	-	-	-	1	1
NE	*Enopla* sp A SCAMIT 1995	-	-	-	-	-	-	1	-	-	1
NE	*Lineus bilineatus*	-	-	-	-	-	-	1	-	-	1
NE	*Tubulanus frenatus*	-	1	-	-	-	-	-	-	-	1
NE	*Tubulanus* sp	1	-	-	-	-	-	-	-	-	1
PL	*Discosolenia burchami*	-	-	1	-	-	-	-	-	-	1
PR	*Phoronopsis* sp	-	-	-	-	-	-	-	1	-	1
	Number of individuals	1436	1750	1970	3134	1512	1607	1237	6813	3883	23342
	Number of species	146	132	151	179	156	100	143	183	196	463
	Diversity (H')	3.978	3.329	3.426	3.282	4.031	2.671	3.864	2.130	3.193	3.833
	Total biomass (g)	41.663	80.427	11.869	25.708	29.099	7.010	101.505	84.243	15.377	396.901

* Only 4 stations sampled in 1998

APPENDIX H

Fish and macroinvertebrate heat treatment and normal operation data

Appendix H-1. Fish and macroinvertebrate heat treatment master species list. El Segundo and Scattergood Generating Stations NPDES, 2001.

PHYLUM / Class / Family / Species	Common Name
CNIDARIA	
Scyphozoa	
Pelagiidae	
Pelagia colorata	purple jellyfish
MOLLUSCA	
Gastropoda	
Aglajidae	
Navanax inermis	navanax
Cardiidae	
Laevicardium substriatum	egg cockle
Cephalopoda	
Octopodidae	
Octopus bimaculoides	California two-spot octopus
ARTHROPODA	
Malacostraca	
Hippolytidae	
Heptacarpus palpator	intertidal coastal (=tiger) shrimp
Lysmata californica	red rock (= red striped) shrimp
Palinuridae	
Panulirus interruptus	California spiny lobster
Majidae	
Loxorhynchus crispatus	masking crab
Loxorhynchus grandis	sheep crab
Pugettia producta	northern kelp crab
Pyromaia tuberculata	tuberculate pear crab
Scyra acutifrons	sharpnose crab
Cancridae	
Cancer amphioetus	bigtooth rock crab
Cancer antennarius	Pacific rock crab
Cancer anthonyi	yellow rock crab
Cancer gracilis	graceful rock crab
Portunidae	
Portunus xantusii	Xantus swimming crab
Xanthidae	
Pilumnus spinohirsutus	retiring hairy crab
Grapsidae	
Hemigrapsus nudus	purple shore crab
Pachygrapsus crassipes	striped shore crab
ECHINODERMATA	
Asteroidea	
Asteriidae	
Pisaster ochraceus	ochre starfish
Holothuroidea	
Stichopodidae	
Parastichopus parvimensis	warty sea cucumber
Parastichopus sp	sea cucumber
VERTEBRATA	
Elasmobranchiomorphi (= Chondrichthyes, Elasmobranchii)	
Heterodontidae	
Heterodontus francisci	horn shark
Scyliorhinidae	
Cephaloscyllium ventriosum	swell shark
Carcharinidae	
Mustelus californicus	gray smoothhound
Rhinobatidae	
Platyrhinoidis triseriata	thornback
Rhinobatos productus	shovelnose guitarfish
Myliobatidae	
Myliobatis californica	bat ray
Urolophidae (Dasyatidae, in part)	
Urolophus halleri	round stingray
Osteichthyes (=Actinopterygii)	
Clupeidae	
Sardinops sagax	Pacific sardine
Engraulidae	
Anchoa compressa	deepbody anchovy
Engraulis mordax	northern anchovy
VERTEBRATA cont'd.	
Ophidiidae	
Ophidion scrippsae	basketweave cusk-eel
Batrachoididae	
Porichthys myriaster	specklefin midshipman
Porichthys notatus	plainfin midshipman
Atherinidae	
Atherinops affinis	topsmelt
Atherinopsis californiensis	jacksmelt
Leuresthes tenuis	California grunion
Scorpaenidae	
Scorpaena guttata	California scorpionfish
Sebastes auriculatus	brown rockfish
Sebastes rastrelliger	grass rockfish
Hexagrammidae	
Oxylebius pictus	painted greenling
Cottidae	
Ruscarius creaseri	roughneck sculpin
Scorpaenichthys marmoratus	cabezon
Serranidae	
Paralabrax clathratus	kelp bass
Paralabrax nebulifer	barred sand bass
Carangidae	
Trachurus symmetricus	jack mackerel
Haemulidae (=Pomadasyidae)	
Anisotremus davidsonii	sargo
Xenistius californiensis	salema
Sciaenidae	
Atractoscion nobilis	white seabass
Cheilotrema saturnum	black croaker
Genyonemus lineatus	white croaker
Menticirrhus undulatus	California corbina
Seriphus politus	queenfish
Umbrina roncador	yellowfin croaker
Kyphosidae (includes Girellidae and Scorpididae)	
Girella nigricans	opaleye
Hermosilla azurea	zebra perch
Medialuna californiensis	halfmoon
Embiotocidae	
Cymatogaster aggregata	shiner perch
Embiotoca jacksoni	black perch
Hyperprosopon argenteum	walleye surfperch
Phanerodon furcatus	white seaperch
Rhacochilus toxotes	rubberlip seaperch
Rhacochilus vacca	pile perch
Pomacentridae	
Chromis punctipinnis	blacksmith
Hypsypops rubicundus	garibaldi
Sphyraenidae	
Sphyraena argentea	California barracuda
Labridae	
Halichoeres semicinctus	rock wrasse
Oxyjulis californica	senorita
Semicossyphus pulcher	California sheephead
Clinidae	
Heterostichus rostratus	giant kelpfish
Blennidae	
Hypsoblennius gilberti	rockpool blenny
Scombridae	
Scomber japonicus	chub mackerel
Stromateidae	
Peprilus simillimus	Pacific pompano
Bothidae (=Paralichthyidae)	
Citharichthys stigmaeus	speckled sanddab
Paralichthys californicus	California halibut
Pleuronectidae	
Hypsopsetta guttulata	diamond turbot
Pleuronichthys ritteri	spotted turbot
Balistidae	
Balistes polylepis	finescale triggerfish

Appendix H-2. Abundance, biomass (kg), and percent occurence of fish impinged at El Segundo Generating Station Units 1 & 2 and 3 & 4. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2		Units 3 & 4		Total		% Comp.	
Species	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
Seriphus politus	495	18.633	1512	41.886	2007	60.519	42.40	9.50
Engraulis mordax	794	8.166	9	0.043	803	8.209	16.96	1.29
Xenistius californiensis	-	-	343	20.650	343	20.650	7.25	3.24
Hyperprosopon argenteum	83	5.131	219	7.946	302	13.077	6.38	2.05
Anisotremus davidsonii	137	79.946	137	58.647	274	138.593	5.79	21.75
Paralabrax clathratus	72	47.150	76	32.480	148	79.630	3.13	12.50
Atherinopsis californiensis	53	3.693	66	7.705	119	11.398	2.51	1.79
Chromis punctipinnis	20	1.154	92	7.686	112	8.840	2.37	1.39
Cymatogaster aggregata	-	-	87	0.836	87	0.836	1.84	0.13
Phanerodon furcatus	31	5.207	34	3.257	65	8.464	1.37	1.33
Scorpaena guttata	44	2.256	17	4.052	61	6.308	1.29	0.99
Embiotoca jacksoni	18	5.557	33	6.159	51	11.716	1.08	1.84
Cheilotrema saturnum	14	4.079	35	5.632	49	9.711	1.04	1.52
Paralabrax nebulifer	4	2.982	43	8.769	47	11.751	0.99	1.84
Paralichthys californicus	40	0.614	1	1.330	41	1.944	0.87	0.31
Heterodontus francisci	30	140.857	-	-	30	140.857	0.63	22.11
Rhacochilus vacca	12	4.026	16	3.582	28	7.608	0.59	1.19
Heterostichus rostratus	27	0.705	-	-	27	0.705	0.57	0.11
Rhacochilus toxotes	6	2.998	16	6.141	22	9.139	0.46	1.43
Girella nigricans	12	12.806	5	3.750	17	16.556	0.36	2.60
Genyonemus lineatus	6	0.255	6	0.167	12	0.422	0.25	0.07
Sardinops sagax	1	0.084	11	1.045	12	1.129	0.25	0.18
Hermosilla azurea	10	4.524	-	-	10	4.524	0.21	0.71
Myliobatis californica	-	-	10	33.071	10	33.071	0.21	5.19
Trachurus symmetricus	10	0.828	-	-	10	0.828	0.21	0.13
Atherinops affinis	-	-	4	0.189	4	0.189	0.08	0.03
Citharichthys stigmaeus	-	-	4	0.053	4	0.053	0.08	0.01
Scorpaenichthys marmoratus	2	1.708	2	1.100	4	2.808	0.08	0.44
Urolophus halleri	1	0.350	3	1.736	4	2.086	0.08	0.33
Cephaloscyllium ventriosum	2	6.400	1	3.000	3	9.400	0.06	1.48
Medialuna californiensis	1	0.473	2	0.866	3	1.339	0.06	0.21
Menticirrhus undulatus	1	0.124	2	1.186	3	1.310	0.06	0.21
Platyrhinoidis triseriata	1	0.281	2	2.900	3	3.181	0.06	0.50
Pleuronichthys ritteri	2	0.263	1	0.159	3	0.422	0.06	0.07
Semicossyphus pulcher	3	6.282	-	-	3	6.282	0.06	0.99
Halichoeres semicinctus	-	-	2	0.328	2	0.328	0.04	0.05
Oxyjulis californica	1	0.150	1	0.023	2	0.173	0.04	0.03
Oxylebius pictus	-	-	2	0.192	2	0.192	0.04	0.03
Atractoscion nobilis	1	0.031	-	-	1	0.031	0.02	0.00
Balistes polylepis	-	-	1	2.150	1	2.150	0.02	0.34
Hypsoblennius gilberti	1	0.003	-	-	1	0.003	0.02	0.00
Hypsopsetta guttulata	1	0.241	-	-	1	0.241	0.02	0.04
Hypsypops rubicundus	1	0.351	-	-	1	0.351	0.02	0.06
Ophidion scrippsae	-	-	1	0.054	1	0.054	0.02	0.01
Porichthys myriaster	-	-	1	0.044	1	0.044	0.02	0.01
Survey totals	1937	368.308	2797	268.814	4734	637.122		
Number of species	35		36		45			

Extrapolation based on flow data, using a multiplier based on total flow of each month, divided by flow of day sampled during the month.

Appendix H-3. Abundance of fish impinged during heat treatments by date at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000	2001				Total	Percent
Species	14 Nov	2 Jan	27 Mar	11 Jul	30 Aug	Abundance	Abundance
Sardinops sagax	19931	-	1	-	-	19932	50.77
Seriphus politus	1390	4384	1530	3133	183	10620	27.05
Atherinops affinis	324	1	90	-	3378	3793	9.66
Atherinopsis californiensis	2707	-	34	8	17	2766	7.05
Genyonemus lineatus	8	6	323	252	-	589	1.50
Hyperprosopon argenteum	12	238	58	13	2	323	0.82
Paralabrax nebulifer	60	52	3	59	69	243	0.62
Xenistius californiensis	139	7	1	21	31	199	0.51
Anisotremus davidsonii	49	12	4	5	43	113	0.29
Myliobatis californica	61	-	-	45	1	107	0.27
Umbrina roncador	69	2	1	18	15	105	0.27
Cheilotrema saturnum	48	8	4	8	5	73	0.19
Cymatogaster aggregata	-	-	1	58	-	59	0.15
Engraulis mordax	-	1	-	39	-	40	0.10
Phanerodon furcatus	26	1	1	7	-	35	0.09
Rhacochilus toxotes	4	12	-	18	-	34	0.09
Chromis punctipinnis	10	21	-	-	2	33	0.08
Urolophus halleri	4	-	-	19	4	27	0.07
Paralabrax clathratus	14	-	-	2	6	22	0.06
Scorpaena guttata	7	4	1	3	7	22	0.06
Embiotoca jacksoni	13	2	-	3	1	19	0.05
Scorpaenichthys marmoratus	2	5	-	5	3	15	0.04
Atractoscion nobilis	7	1	1	-	2	11	0.03
Menticirrhus undulatus	-	1	5	2	2	10	0.03
Peprilus semillimus	6	3	-	-	-	9	0.02
Pleuronichthys ritteri	3	4	-	2	-	9	0.02
Paralichthys californicus	-	2	-	1	2	5	0.01
Scomber japonicus	5	-	-	-	-	5	0.01
Leuresthes tenuis	-	-	1	-	3	4	0.01
Sphyraena argentea	4	-	-	-	-	4	0.01
Halichoeres semicinctus	1	-	-	-	2	3	0.01
Medialuna californiensis	1	-	-	-	2	3	0.01
Mustelus californicus	1	2	-	-	-	3	0.01
Rhinobatos productus	-	-	-	1	2	3	0.01
Girella nigricans	1	1	-	-	-	2	0.01
Hypsoblennius gilberti	1	1	-	-	-	2	0.01
Platyrhinoidis triseriata	-	2	-	-	-	2	0.01
Ruscarius creaseri	-	-	-	2	-	2	0.01
Sebastes auriculatus	-	1	-	-	1	2	0.01
Anchoa compressa	-	1	-	-	-	1	0.00
Heterodontus francisci	-	-	-	-	1	1	0.00
Heterostichus rostratus	-	-	-	1	-	1	0.00
Oxyjulis californica	-	1	-	-	-	1	0.00
Porichthys notatus	-	-	-	1	-	1	0.00
Rhacochilus vacca	1	-	-	-	-	1	0.00
Sebastes rastrelliger	1	-	-	-	-	1	0.00
Trachurus symmetricus	-	1	-	-	-	1	0.00
Number of individuals	24910	4777	2059	3726	3784	39256	
Number of species	32	29	17	26	25	47	

Note: 0.00<0.005

Appendix H-4. Abundance of fish impinged during heat treatments at El Segundo Generating Station, Units 1 & 2 and Units 3 & 4. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2				Units 3 & 4							
	2000	2001			2000	2001				Combined	Percent	Cum.
Species	12/22	2/1	4/30	Total	10/7	1/28	7/8	8/26	Total	Total	Total	Percent
Seriphus politus	91	26	378	495	123	338	993	58	1512	2007	45.56	45.6
Engraulis mordax	1	-	718	719	8	1	-	-	9	728	16.53	62.1
Xenistius californiensis	-	-	-	-	335	1	6	1	343	343	7.79	69.9
Anisotremus davidsonii	27	50	60	137	131	4	1	1	137	274	6.22	76.1
Hyperprosopon argenteum	39	14	30	83	19	127	38	4	188	271	6.15	82.2
Paralabrax clathratus	15	31	26	72	28	27	13	8	76	148	3.36	85.6
Chromis punctipinnis	9	10	1	20	3	62	27	-	92	112	2.54	88.1
Cymatogaster aggregata	-	-	-	-	1	-	85	1	87	87	1.98	90.1
Phanerodon furcatus	6	2	23	31	-	4	30	-	34	65	1.48	91.6
Atherinopsis californiensis	39	-	14	53	3	-	1	-	4	57	1.29	92.9
Embiotoca jacksoni	13	-	5	18	6	10	14	3	33	51	1.16	94.1
Cheilotrema saturnum	10	2	2	14	16	13	3	3	35	49	1.11	95.2
Rhacochilus vacca	5	7	-	12	1	11	4	-	16	28	0.64	95.8
Scorpaena guttata	2	1	3	6	7	2	8	-	17	23	0.52	96.3
Rhacochilus toxotes	3	1	2	6	4	2	10	-	16	22	0.50	96.8
Girella nigricans	1	3	8	12	5	-	-	-	5	17	0.39	97.2
Paralabrax nebulifer	2	2	-	4	7	3	1	1	12	16	0.36	97.6
Genyonemus lineatus	6	-	-	6	1	1	4	-	6	12	0.27	97.8
Sardinops sagax	1	-	-	1	-	3	8	-	11	12	0.27	98.1
Hermosilla azurea	-	10	-	10	-	-	-	-	-	10	0.23	98.3
Myliobatis californica	-	-	-	-	1	1	8	-	10	10	0.23	98.6
Trachurus symmetricus	-	-	10	10	-	-	-	-	-	10	0.23	98.8
Atherinops affinis	-	-	-	-	-	3	1		4	4	0.09	98.9
Citharichthys stigmaeus	-	-	-	-	-	-	4	-	4	4	0.09	99.0
Scorpaenichthys marmoratus	-	-	2	2	2	-	-	-	2	4	0.09	99.1
Urolophus halleri	1	-	-	1	1	-	2	-	3	4	0.09	99.2
Cephaloscyllium ventriosum	-	-	2	2	-	1	-	-	1	3	0.07	99.2
Heterodontus francisci	-	1	2	3	-	-	-	-	-	3	0.07	99.3
Medialuna californiensis	-	-	1	1	-	2	-	-	2	3	0.07	99.4
Menticirrhus undulatus	-	-	1	1	-	-	-	2	2	3	0.07	99.4
Paralichthys californicus	-	1	1	2	1	-	-	-	1	3	0.07	99.5
Platyrhinoidis triseriata	1	-	-	1	2	-	-	-	2	3	0.07	99.6
Pleuronichthys ritteri	-	2	-	2	-	1	-	-	1	3	0.07	99.6
Semicossyphus pulcher	3			3	-	-	-	-	-	3	0.07	99.7
Halichoeres semicinctus	-	-	-	-	-	-	2	-	2	2	0.05	99.8
Oxyjulis californica	-	1	-	1	-	-	1	-	1	2	0.05	99.8
Oxylebius pictus	-	-	-	-	1	1	-	-	2	2	0.05	99.8
Atractoscion nobilis	1	-	-	1	-	-	-	-	-	1	0.02	99.9
Balistes polylepis	-	-	-	-	-	-	1	-	1	1	0.02	99.9
Hypsoblennius gilberti	-	-	1	1	-	-	-	-	-	1	0.02	99.9
Hypsopsetta guttulata	-	-	1	1	-	-	-	-	-	1	0.02	99.9
Hypsypops rubicundus	1	-	-	1	-	-	-	-	-	1	0.02	100.0
Ophidion scrippsae	-	-	-	-	-	1	-	-	1	1	0.02	100.0
Porichthys myriaster	-	-	-	-	1	-	-	-	1	1	0.02	100.0
Number of individuals	277	164	1291	1732	707	619	1265	82	2673	4405		
Number of species	22	17	22	34	24	23	24	10	36	44		

Appendix H-5. Abundance and biomass of fish impinged during heat treatments (HT) and normal operations (NO) at El Segundo Generating Station, Units 1 & 2. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2 Heat Treatment		Units 1 & 2 Monitored NO		Units 1 & 2 Extrapolated NO		Units 1 & 2 Combined NO and HT	
Species	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
Engraulis mordax	719	7.000	2	4.720	75	1.166	794	8.166
Seriphus politus	495	18.633	-	-	-	-	495	18.633
Anisotremus davidsonii	137	79.946	-	-	-	-	137	79.946
Hyperprosopon argenteum	83	5.131	-	-	-	-	83	5.131
Paralabrax clathratus	72	47.150	-	-	-	-	72	47.150
Atherinopsis californiensis	53	3.693	-	-	-	-	53	3.693
Scorpaena guttata	6	1.993	1	0.007	38	0.263	44	2.256
Paralichthys californicus	2	0.351	1	0.007	38	0.263	40	0.614
Phanerodon furcatus	31	5.207	-	-	-	-	31	5.207
Heterodontus francisci	3	12.950	1	0.031	27	127.907	30	140.857
Heterostichus rostratus	-	-	1	0.026	27	0.705	27	0.705
Chromis punctipinnis	20	1.154	-	-	-	-	20	1.154
Embiotoca jacksoni	18	5.557	-	-	-	-	18	5.557
Cheilotrema saturnum	14	4.079	-	-	-	-	14	4.079
Girella nigricans	12	12.806	-	-	-	-	12	12.806
Rhacochilus vacca	12	4.026	-	-	-	-	12	4.026
Hermosilla azurea	10	4.524	-	-	-	-	10	4.524
Trachurus symmetricus	10	0.828	-	-	-	-	10	0.828
Genyonemus lineatus	6	0.255	-	-	-	-	6	0.255
Rhacochilus toxotes	6	2.998	-	-	-	-	6	2.998
Paralabrax nebulifer	4	2.982	-	-	-	-	4	2.982
Semicossyphus pulcher	3	6.282	-	-	-	-	3	6.282
Cephaloscyllium ventriosum	2	6.400	-	-	-	-	2	6.400
Pleuronichthys ritteri	2	0.263	-	-	-	-	2	0.263
Scorpaenichthys marmoratus	2	1.708	-	-	-	-	2	1.708
Atractoscion nobilis	1	0.031	-	-	-	-	1	0.031
Hypsoblennius gilberti	1	0.003	-	-	-	-	1	0.003
Hypsopsetta guttulata	1	0.241	-	-	-	-	1	0.241
Hypsypops rubicundus	1	0.351	-	-	-	-	1	0.351
Medialuna californiensis	1	0.473	-	-	-	-	1	0.473
Menticirrhus undulatus	1	0.124	-	-	-	-	1	0.124
Oxyjulis californica	1	0.150	-	-	-	-	1	0.150
Platyrhinoidis triseriata	1	0.281	-	-	-	-	1	0.281
Sardinops sagax	1	0.084	-	-	-	-	1	0.084
Urolophus halleri	1	0.350	-	-	-	-	1	0.350
Survey totals	1732	238.004	6	4.791	205	130.304	1937	368.308
Number of species	34		5		5		35	

Extrapolation based on flow data, using a multiplier based on total flow of each month, divided by flow of day sampled during the month.

Appendix H-6. Abundance and biomass of fish impinged during heat treatments (HT) and normal operations (NO) at El Segundo Generating Station, Units 3 & 4. El Segundo and Scattergood Generating Stations NPDES,

	Units 3 & 4 Heat Treatment		Units 3 & 4 Monitored NO		Units 3 & 4 Extrapolated NO		Units 3 & 4 Combined NO and HT	
Species	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
Seriphus politus	1512	41.886	-	-	-	-	1512	41.886
Xenistius californiensis	343	20.650	-	-	-	-	343	20.650
Hyperprosopon argenteum	188	7.760	1	0.006	31	0.186	219	7.946
Anisotremus davidsonii	137	58.647	-	-	-	-	137	58.647
Chromis punctipinnis	92	7.686	-	-	-	-	92	7.686
Cymatogaster aggregata	87	0.836	-	-	-	-	87	0.836
Paralabrax clathratus	76	32.480	-	-	-	-	76	32.480
Atherinopsis californiensis	4	0.209	2	0.242	62	7.496	66	7.705
Paralabrax nebulifer	12	4.681	1	0.132	31	4.088	43	8.769
Cheilotrema saturnum	35	5.632	-	-	-	-	35	5.632
Phanerodon furcatus	34	3.257	-	-	-	-	34	3.257
Embiotoca jacksoni	33	6.159	-	-	-	-	33	6.159
Scorpaena guttata	17	4.052	-	-	-	-	17	4.052
Rhacochilus toxotes	16	6.141	-	-	-	-	16	6.141
Rhacochilus vacca	16	3.582	-	-	-	-	16	3.582
Sardinops sagax	11	1.045	-	-	-	-	11	1.045
Myliobatis californica	10	33.071	-	-	-	-	10	33.071
Engraulis mordax	9	0.043	-	-	-	-	9	0.043
Genyonemus lineatus	6	0.167	-	-	-	-	6	0.167
Girella nigricans	5	3.750	-	-	-	-	5	3.750
Atherinops affinis	4	0.189	-	-	-	-	4	0.189
Citharichthys stigmaeus	4	0.053	-	-	-	-	4	0.053
Urolophus halleri	3	1.736	-	-	-	-	3	1.736
Halichoeres semicinctus	2	0.328	-	-	-	-	2	0.328
Medialuna californiensis	2	0.866	-	-	-	-	2	0.866
Menticirrhus undulatus	2	1.186	-	-	-	-	2	1.186
Oxylebius pictus	2	0.192	-	-	-	-	2	0.192
Platyrhinoidis triseriata	2	2.900	-	-	-	-	2	2.900
Scorpaenichthys marmoratus	2	1.100	-	-	-	-	2	1.100
Balistes polylepis	1	2.150	-	-	-	-	1	2.150
Cephaloscyllium ventriosum	1	3.000	-	-	-	-	1	3.000
Ophidion scrippsae	1	0.054	-	-	-	-	1	0.054
Oxyjulis californica	1	0.023	-	-	-	-	1	0.023
Paralichthys californicus	1	1.330	-	-	-	-	1	1.330
Pleuronichthys ritteri	1	0.159	-	-	-	-	1	0.159
Porichthys myriaster	1	0.044	-	-	-	-	1	0.044
Survey totals	2673	257.044	4	0.380	124	11.770	2797	268.814
Number of species	36		3		3		36	

Extrapolation based on flow data, using a multiplier based on total flow of each month, divided by flow of day sampled during the month.

Appendix H-7. Biomass (kg) of fish impinged during heat treatments at El Segundo Generating Station, Units 1 & 2 and Units 3 & 4. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2				Units 3 & 4							
	2000	2001			2000	2001				Combined	Percent	Cum.
Species	12/22	2/1	4/30	Total	10/7	1/28	7/8	8/26	Total	Total	Total	Percent
Anisotremus davidsonii	16.476	29.020	34.450	79.946	56.540	0.842	0.650	0.615	58.647	138.593	28.00	28.0
Seriphus politus	2.708	0.885	15.040	18.633	2.220	10.991	27.050	1.625	41.886	60.519	12.22	40.2
Myliobatis californica	-	-	-	-	0.524	0.297	32.250	-	33.071	33.071	6.68	46.9
Paralabrax clathratus	5.680	23.040	18.430	47.150	12.960	8.958	7.750	2.812	32.480	79.630	16.09	63.0
Xenistius californiensis	-	-	-	-	20.090	0.010	0.474	0.076	20.650	20.650	4.17	67.2
Hyperprosopon argenteum	1.636	0.845	2.650	5.131	0.585	3.919	3.150	0.106	7.760	12.891	2.60	69.8
Chromis punctipinnis	0.068	1.017	0.069	1.154	0.352	6.106	1.228	-	7.686	8.840	1.79	71.5
Embiotoca jacksoni	3.944	-	1.613	5.557	1.820	2.856	0.950	0.533	6.159	11.716	2.37	73.9
Rhacochilus toxotes	1.859	0.464	0.675	2.998	3.140	0.751	2.250	-	6.141	9.139	1.85	75.8
Cheilotrema saturnum	2.986	0.593	0.500	4.079	3.034	1.540	0.763	0.295	5.632	9.711	1.96	77.7
Paralabrax nebulifer	2.260	0.722	-	2.982	2.440	1.180	0.256	0.805	4.681	7.663	1.55	79.3
Scorpaena guttata	0.667	0.250	1.076	1.993	1.667	0.235	2.150	-	4.052	6.045	1.22	80.5
Girella nigricans	0.642	2.714	9.450	12.806	3.750	-	-	-	3.750	16.556	3.34	83.8
Rhacochilus vacca	1.629	2.397	-	4.026	0.247	3.060	0.275	-	3.582	7.608	1.54	85.4
Phanerodon furcatus	0.435	0.422	4.350	5.207	-	0.457	2.800	-	3.257	8.464	1.71	87.1
Cephaloscyllium ventriosum	-	-	6.400	6.400	-	3.000	-	-	3.000	9.400	1.90	89.0
Platyrhinoidis triseriata	0.281	-	-	0.281	2.900	-	-	-	2.900	3.181	0.64	89.6
Balistes polylepis	-	-	-	-	-	-	2.150	-	2.150	2.150	0.43	90.1
Urolophus halleri	0.350	-	-	0.350	0.386	-	1.350	-	1.736	2.086	0.42	90.5
Paralichthys californicus	-	0.289	0.062	0.351	1.330	-	-	-	1.330	1.681	0.34	90.8
Menticirrhus undulatus	-	-	0.124	0.124	-	-	-	1.186	1.186	1.310	0.26	91.1
Scorpaenichthys marmoratus	-	-	1.708	1.708	1.100	-	-	-	1.100	2.808	0.57	91.7
Sardinops sagax	0.084	-	-	0.084	-	0.183	0.862	-	1.045	1.129	0.23	91.9
Medialuna californiensis	-	-	0.473	0.473	-	0.866	-	-	0.866	1.339	0.27	92.1
Cymatogaster aggregata	-	-	-	-	0.013	-	0.795	0.028	0.836	0.836	0.17	92.3
Halichoeres semicinctus	-	-	-	-	-	-	0.328	-	0.328	0.328	0.07	92.4
Atherinopsis californiensis	3.185	-	0.508	3.693	0.164	-	0.045	-	0.209	3.902	0.79	93.2
Oxylebius pictus	-	-	-	-	0.072	0.120	-	-	0.192	0.192	0.04	93.2
Atherinops affinis	-	-	-	-	-	0.150	0.039	-	0.189	0.189	0.04	93.2
Genyonemus lineatus	0.255	-	-	0.255	0.017	0.075	0.075	-	0.167	0.422	0.09	93.3
Pleuronichthys ritteri	-	0.263	-	0.263	-	0.159	-	-	0.159	0.422	0.09	93.4
Ophidion scrippsae	-	-	-	-	-	0.054	-	-	0.054	0.054	0.01	93.4
Citharichthys stigmaeus	-	-	-	-	-	-	0.053	-	0.053	0.053	0.01	93.4
Porichthys myriaster	-	-	-	-	0.044	-	-	-	0.044	0.044	0.01	93.4
Engraulis mordax	0.002	-	6.998	7.000	0.031	0.012	-	-	0.043	7.043	1.42	94.9
Oxyjulis californica	-	0.150	-	0.150	-	-	0.023	-	0.023	0.173	0.03	94.9
Atractoscion nobilis	0.031	-	-	0.031	-	-	-	-	-	0.031	0.01	94.9
Hermosilla azurea	-	4.524	-	4.524	-	-	-	-	-	4.524	0.91	95.8
Heterodontus francisci	-	6.130	6.820	12.950	-	-	-	-	-	12.950	2.62	98.4
Hypsoblennius gilberti	-	-	0.003	0.003	-	-	-	-	-	0.003	0.00	98.4
Hypsopsetta guttulata	-	-	0.241	0.241	-	-	-	-	-	0.241	0.05	98.5
Hypsypops rubicundus	0.351	-	-	0.351	-	-	-	-	-	0.351	0.07	98.6
Semicossyphus pulcher	6.282	-	-	6.282	-	-	-	-	-	6.282	1.27	99.8
Trachurus symmetricus	-	-	0.828	0.828	-	-	-	-	-	0.828	0.17	100.0
Biomass (kg)	51.811	73.725	112.468	238.004	115.426	45.821	87.716	8.081	257.044	495.048		

Appendix H-8. Biomass (kg) of fish impinged during heat treatments by date at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000	2001				Total	Percent
Species	14 Nov	2 Jan	27 Mar	11 Jul	30 Aug	Biomass	Biomass
Sardinops sagax	671.319	-	0.046	-	-	671.365	31.63
Myliobatis californica	38.780	-	-	391.740	3.200	433.720	20.43
Seriphus politus	36.552	140.300	55.630	75.190	4.950	312.622	14.73
Atherinopsis californiensis	269.245	-	3.049	0.204	5.130	277.628	13.08
Atherinops affinis	12.172	0.024	3.359	-	90.360	105.915	4.99
Paralabrax nebulifer	19.27	21.280	0.945	20.610	24.240	86.345	4.07
Anisotremus davidsonii	28.660	9.000	3.660	1.303	24.790	67.413	3.18
Genyonemus lineatus	0.196	0.720	26.000	4.030	-	30.946	1.46
Umbrina roncador	13.122	0.215	0.254	5.214	3.990	22.795	1.07
Urolophus halleri	1.667	-	-	13.240	2.750	17.657	0.83
Hyperprosopon argenteum	0.753	10.910	3.649	0.252	0.045	15.609	0.74
Rhinobatos productus	-	-	-	4.420	10.270	14.690	0.69
Xenistius californiensis	6.620	0.033	0.009	1.896	2.147	10.705	0.50
Scorpaena guttata	2.114	0.841	0.002	0.229	2.740	5.926	0.28
Scorpaenichthys marmoratus	0.470	1.858	-	2.236	1.273	5.837	0.27
Cheilotrema saturnum	2.844	0.555	0.142	1.086	0.656	5.283	0.25
Paralichthys californicus	-	1.543	-	0.122	3.300	4.965	0.23
Rhacochilus toxotes	0.421	2.980	-	1.392	-	4.793	0.23
Chromis punctipinnis	0.172	3.575	-	-	0.193	3.940	0.19
Mustelus californicus	2.255	0.918	-	-	-	3.173	0.15
Embiotoca jacksoni	2.031	0.535	-	0.315	0.214	3.095	0.15
Atractoscion nobilis	2.327	0.031	0.046	-	0.187	2.591	0.12
Girella nigricans	0.849	1.202	-	-	-	2.051	0.10
Sphyraena argentea	1.710	-	-	-	-	1.710	0.08
Menticirrhus undulatus	-	0.229	0.474	0.575	0.356	1.634	0.08
Paralabrax clathratus	0.540	-	-	0.468	0.531	1.539	0.07
Phanerodon furcatus	1.182	0.044	0.076	0.075	-	1.377	0.06
Platyrhinoidis triseriata	-	0.864	-	-	-	0.864	0.04
Heterodontus francisci	-	-	-	-	0.823	0.823	0.04
Cymatogaster aggregata	-	-	0.069	0.699	-	0.768	0.04
Pleuronichthys ritteri	0.383	0.363	-	0.011	-	0.757	0.04
Scomber japonicus	0.683	-	-	-	-	0.683	0.03
Sebastes rastrelliger	0.658	-	-	-	-	0.658	0.03
Halichoeres semicinctus	0.227	-	-	-	0.344	0.571	0.03
Sebastes auriculatus	-	0.294	-	-	0.197	0.491	0.02
Engraulis mordax	-	0.009	-	0.447	-	0.456	0.02
Porichthys notatus	-	-	-	0.394	-	0.394	0.02
Peprilus semillimus	0.155	0.139	-	-	-	0.294	0.01
Medialuna californiensis	0.087	-	-	-	0.154	0.241	0.01
Heterostichus rostratus	-	-	-	0.117	-	0.117	0.01
Oxyjulis californica	-	0.110	-	-	-	0.110	0.01
Rhacochilus vacca	0.107	-	-	-	-	0.107	0.01
Trachurus symmetricus	-	0.107	-	-	-	0.107	0.01
Leuresthes tenuis	-	-	0.017	-	0.059	0.076	0.00
Anchoa compressa	-	0.017	-	-	-	0.017	0.00
Hypsoblennius gilberti	0.001	0.005	-	-	-	0.006	0.00
Ruscarius creaseri	-	-	-	0.002	-	0.002	0.00
Biomass	1117.572	198.701	97.427	526.267	182.899	2122.866	

Note: 0.00<0.005

Appendix H-9. Abundance, biomass (kg), and percent occurence of macroinvertebrates impinged at El Segundo Generating Station, Units 1 & 2 and 3 & 4. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2		Units 3 & 4		Total		% Comp.	
Species	Abund.	Biomass	Abund.	Biomass	Abund.	Biomass	Abund.	Biomass
Cancer antennarius	15049	145.229	12617	629.852	27666	775.081	85.34	49.39
Cancer anthonyi	512	16.110	1129	45.922	1641	62.032	5.06	3.95
Cancer gracilis	22	0.052	876	36.452	898	36.504	2.77	2.33
Pelagia colorata	3	2.700	736	461.772	739	464.472	2.28	29.60
Pyromaia tuberculata	37	0.029	478	1.189	515	1.218	1.59	0.08
Panulirus interruptus	208	84.334	197	96.435	405	180.769	1.25	11.52
Lysmata californica	78	0.160	325	0.427	403	0.587	1.24	0.04
Pachygrapsus crassipes	-	-	76	0.606	76	0.606	0.23	0.04
Octopus bimaculoides	6	7.995	33	39.365	39	47.360	0.12	3.02
Portunus xantusii	13	0.127	13	0.087	26	0.214	0.08	0.01
Heptacarpus palpator	-	-	6	0.007	6	0.007	0.02	0.00
Parastichopus parvimensis	-	-	3	0.335	3	0.335	0.01	0.02
Navanax inermis	-	-	1	0.013	1	0.013	0.00	0.00
Parastichopus sp	1	0.012	-	-	1	0.012	0.00	0.00
Survey totals	15929	256.748	16490	1312.462	32419	1569.210		
Number of species	10		13		14			

Note: 0.00 < 0.005

Appendix H-10. Abundance and biomass (kg) of macroinvertebrates impinged in heat treatments (HT) and normal operations (NO) at El Segundo Generating Station, Units 1 & 2. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2 Heat Treatment		Units 1 & 2 Monitored NO		Units 1 & 2 Extrapolated NO		Units 1 & 2 Combined NO and HT	
Species	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
Cancer antennarius	92	1.769	514	5.000	14957	143.460	15049	145.229
Cancer anthonyi	512	16.110	-	-	-	-	512	16.110
Panulirus interruptus	208	84.334	-	-	-	-	208	84.334
Lysmata californica	78	0.160	-	-	-	-	78	0.160
Pyromaia tuberculata	37	0.029	-	-	-	-	37	0.029
Cancer gracilis	22	0.052	-	-	-	-	22	0.052
Portunus xantusii	13	0.127	-	-	-	-	13	0.127
Octopus bimaculoides	6	7.995	-	-	-	-	6	7.995
Pelagia colorata	3	2.700	-	-	-	-	3	2.700
Parastichopus sp	1	0.012	-	-	-	-	1	0.012
Survey totals	972	113.288	514	5.000	14957	143.460	15929	256.748
Number of species	10		1		1		10	

Extrapolation based on flow data, using a multiplier based on total flow of each month, divided by flow of day sampled during the month.

Appendix H-11. Abundance and biomass (kg) of macroinvertebrates impinged in heat treatments (HT) and normal operations (NO) at El Segundo Generating Station, Units 3 & 4. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 3 & 4 Heat Treatment		Units 3 & 4 Monitored NO		Units 3 & 4 Extrapolated NO		Units 3 & 4 Combined NO and HT	
Species	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
Cancer antennarius	39	1.625	421	20.976	12578	628.227	12617	629.852
Cancer anthonyi	1129	45.922	-	-	-	-	1129	45.922
Cancer gracilis	876	36.452	-	-	-	-	876	36.452
Pelagia colorata	-	-	27	17.300	736	461.772	736	461.772
Pyromaia tuberculata	30	0.111	17	0.040	448	1.078	478	1.189
Lysmata californica	325	0.427	-	-	-	-	325	0.427
Panulirus interruptus	81	52.835	4	1.500	116	43.600	197	96.435
Pachygrapsus crassipes	76	0.606	-	-	-	-	76	0.606
Octopus bimaculoides	12	14.360	1	1.200	21	25.005	33	39.365
Portunus xantusii	13	0.087	-	-	-	-	13	0.087
Heptacarpus palpator	6	0.007	-	-	-	-	6	0.007
Parastichopus parvimensis	3	0.335	-	-	-	-	3	0.335
Navanax inermis	1	0.013	-	-	-	-	1	0.013
Survey totals	2591	152.780	470	41.016	13899	1159.682	16490	1312.462
Number of species	12		5		5		13	

Extrapolation based on flow data, using a multiplier based on total flow of each month, divided by flow of day sampled during the month.

Appendix H-12. Abundance of macroinvertebrates impinged during heat treatments at El Segundo Generating Station, Units 1 & 2 and Units 3 & 4. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2				Units 3 & 4							
	2000	2001			2000	2001				Combined	Percent	Cum.
Species	12/22	2/1	4/30	Total	10/7	1/28	7/8	8/26	Total	Total	Total	Percent
Cancer antennarius	50	2	40	92	-	2	36	1	39	131	3.7	3.7
Cancer anthonyi	500	2	10	512	-	118	1011	-	1129	1641	46.1	49.7
Cancer gracilis	-	-	22	22	-	7	833	36	876	898	25.2	74.9
Heptacarpus palpator	-	-	-	-	-	6	-	-	6	6	0.2	75.1
Lysmata californica	70	-	8	78	-	3	320	2	325	403	11.3	86.4
Navanax inermis	-	-	-	-	-	1	-	-	1	1	0.0	86.4
Octopus bimaculoides	2	1	3	6	1	7	4	-	12	18	0.5	86.9
Pachygrapsus crassipes	-	-	-	-	19	41	-	16	76	76	2.1	89.1
Panulirus interruptus	19	31	158	208	45	18	16	2	81	289	8.1	97.2
Parastichopus parvimensis	-	-	-	-	-	3	-	-	3	3	0.1	97.3
Parastichopus sp	-	-	1	1	-	-	-	-	-	1	0.0	97.3
Pelagia colorata	-	-	3	3	-	-	-	-	-	3	0.1	97.4
Portunus xantusii	12	-	1	13	-	13	-	-	13	26	0.7	98.1
Pyromaia tuberculata	17	-	20	37	-	6	-	24	30	67	1.9	100.0
Number of individuals	670	36	266	972	65	225	2220	81	2591	3563		
Number of species	7	4	10	10	3	12	6	6	12	14		

Appendix H-13. Biomass (kg) of macroinvertebrates impinged during heat treatments at El Segundo Generating Station, Units 1 & 2 and Units 3 & 4. El Segundo and Scattergood Generating Stations NPDES, 2001.

	Units 1 & 2				Units 3 & 4							
	2000	2001			2000	2001				Combined	Percent	Cum.
Species	12/22	2/1	4/30	Total	10/7	1/28	7/8	8/26	Total	Total	Total	Percent
Cancer antennarius	1.600	0.054	0.115	1.769	-	0.070	1.55	0.005	1.625	3.394	0.10	0.1
Cancer anthonyi	16.000	0.078	0.032	16.110	-	2.022	43.90	-	45.922	62.032	1.74	1.8
Cancer gracilis	-	-	0.052	0.052	-	0.074	36.15	0.228	36.452	36.504	1.02	2.9
Heptacarpus palpator	-	-	-	-	-	0.007	-	-	0.007	0.007	0.00	2.9
Lysmata californica	0.150	-	0.010	0.160	-	0.009	0.415	0.003	0.427	0.587	0.02	2.9
Navanax inermis	-	-	-	-	-	0.013	-	-	0.013	0.013	0.00	2.9
Octopus bimaculoides	2.496	0.999	4.500	7.995	0.36	8.500	5.500	-	14.360	22.355	0.63	3.5
Pachygrapsus crassipes	-	-	-	-	0.150	0.366	-	0.090	0.606	0.606	0.02	3.5
Panulirus interruptus	7.284	9.400	67.650	84.334	38.50	6.390	5.650	2.295	52.835	137.169	3.85	7.4
Parastichopus parvimensis	-	-	-	-	-	0.335	-	-	0.335	0.335	0.01	7.4
Parastichopus sp	-	-	0.012	0.012	-	-	-	-	-	0.012	0.00	7.4
Pelagia colorata	-	-	2.700	2.700	-	-	-	-	-	2.700	0.08	7.5
Portunus xantusii	0.123	-	0.004	0.127	-	0.087	-	-	0.087	0.214	0.01	7.5
Pyromaia tuberculata	0.011	-	0.018	0.029	-	0.015	-	0.096	0.111	0.140	0.00	7.5
Number of individuals	27.664	10.531	75.093	113.288	39.010	17.888	93.165	2.717	152.780	266.068		
Number of species	7	4	10	10	3	12	6	6	12	14		

Appendix H-14. Abundance of macroinvertebrates impinged during heat treatments by date at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000	2001				Total	Percent	Cum.
Species	14 Nov	2 Jan	27 Mar	11 Jul	30 Aug	Abundance	Total	Percent
Lysmata californica	100	50	2	652	20	824	28.0	28.0
Cancer anthonyi	240	34	-	456	-	730	24.8	52.8
Cancer gracilis	-	-	-	521	14	535	18.2	71.0
Heptacarpus palpator	24	-	1	193	-	218	7.4	78.4
Panulirus interruptus	52	19	-	27	107	205	7.0	85.4
Cancer antennarius	4	10	6	44	76	140	4.8	90.2
Pyromaia tuberculata	64	-	-	36	2	102	3.5	93.6
Portunus xantusii	-	28	-	20	2	50	1.7	95.3
Octopus bimaculoides	16	13	-	5	6	40	1.4	96.7
Pachygrapsus crassipes	-	9	-	-	26	35	1.2	97.9
Cancer amphioetus	20	-	-	-	-	20	0.7	98.6
Navanax inermis	12	2	1	-	-	15	0.5	99.1
Pugettia producta	8	-	-	-	2	10	0.3	99.4
Loxorhynchus crispatus	4	1	-	-	-	5	0.2	99.6
Pilumnus spinohirsutus	-	3	-	-	-	3	0.1	99.7
Laevicardium substriatum	-	-	-	-	2	2	0.1	99.8
Loxorhynchus grandis	-	-	-	-	2	2	0.1	99.8
Pisaster ochraeus	-	2	-	-	-	2	0.1	99.9
Hemigrapsus nudis	-	-	-	1	-	1	0.0	99.9
Parastichopus parvimensis	-	1	-	-	-	1	0.0	100.0
Scyra acutifrons	-	1	-	-	-	1	0.0	100.0
Number of individuals	544	173	10	1955	259	2941		
Number of species	11	13	4	10	11	21		

Note: 0.0 < 0.05

Appendix H-15. Biomass (kg) of macroinvertebrates impinged during heat treatments by date at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000	2001				Total	Percent	Cum.
Species	14 Nov	2 Jan	27 Mar	11 Jul	30 Aug	Biomass	Total	Percent
Panulirus interruptus	28.546	7.710	-	22.155	80.520	138.931	74.4	74.4
Octopus bimaculoides	9.740	11.160	-	0.327	0.768	21.995	11.8	86.2
Cancer anthonyi	0.508	0.104	-	12.500	-	13.112	7.0	93.2
Cancer gracilis	-	-	-	7.553	0.029	7.582	4.1	97.3
Cancer antennarius	0.040	0.068	0.018	0.853	0.248	1.227	0.7	97.9
Lysmata californica	0.064	0.005	0.001	1.082	0.050	1.202	0.6	98.6
Loxorhynchus grandis	-	-	-	-	1.050	1.050	0.6	99.1
Pisaster ochraeus	-	0.574	-	-	-	0.574	0.3	99.4
Portunus xantusii	-	0.087	-	0.326	0.002	0.415	0.2	99.7
Heptacarpus palpator	0.008	-	0.002	0.150	-	0.160	0.1	99.7
Pachygrapsus crassipes	-	0.027	-	-	0.096	0.123	0.1	99.8
Navanax inermis	0.100	0.012	0.007	-	-	0.119	0.1	99.9
Pyromaia tuberculata	0.044	-	-	0.048	0.002	0.094	0.1	99.9
Loxorhynchus crispatus	0.028	0.016	-	-	-	0.044	0.0	99.9
Cancer amphioetus	0.040	-	-	-	-	0.040	0.0	100.0
Pugettia producta	0.028	-	-	-	0.002	0.030	0.0	100.0
Parastichopus parvimensis	-	0.015	-	-	-	0.015	0.0	100.0
Pilumnus spinohirsutus	-	0.008	-	-	-	0.008	0.0	100.0
Hemigrapsus nudis	-	-	-	0.003	-	0.003	0.0	100.0
Laevicardium substriatum	-	-	-	-	0.001	0.001	0.0	100.0
Scyra acutifrons	-	0.001	-	-	-	0.001	0.0	100.0
Total biomass	39.146	19.787	0.028	44.997	82.768	186.726		

Note: 0.0 < 0.05

Appendix H-16. Abundance of fish impinged during normal operation by month, Units 1 & 2, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Species	ns	29	20	ns	22	23	25	ns	21	24	31	ns			
Engraulis mordax			-		-	-	2		-	-			2	33.3	33.3
Heterodontus francisci			-		1	-	-		-	-			1	16.7	50.0
Heterostichus rostratus			-		1	-	-		-	-			1	16.7	66.7
Paralichthys californicus			-		-	-	1		-	-			1	16.7	83.3
Scorpaena guttata			-		-	-	1		-	-			1	16.7	100.0
Number of individuals	ns	nc	-	ns	2	-	4	nc	-	-	nc	ns	6		
Number of species			-		2	-	3		-	-			5		

ns = not sampled during the month; nc = circulator pumps not operating

Appendix H-17. Biomass (kg) of fish impinged during normal operation by month, Units 1 & 2, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
Species	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Heterodontus francisci			-		4.720	-	-		-	-			4.720	98.5	98.5
Engraulis mordax			-		-	-	0.031		-	-			0.031	0.6	99.2
Heterostichus rostratus			-		0.026	-	-		-	-			0.026	0.5	99.7
Paralichthys californicus			-		-	-	0.007		-	-			0.007	0.1	99.9
Scorpaena guttata			-		-	-	0.007		-	-			0.007	0.1	100.0
Biomass (kg)	ns	nc	-	ns	4.746	-	0.045	nc	-	-	nc	ns	4.791		

ns = not sampled during the month; nc = circulator pumps not operating

Appendix H-18. Abundance of macroinvertebrates impinged during normal operation by month, Units 1 and 2, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Species	ns	29	20	ns	22	23	25	ns	21	24	31	ns			
Cancer antennarius			314		-	-	200		-	-			514	100.0	100.0
Number of individuals	ns	nc	314	ns	-	-	200	nc	-	-	nc	ns	514		
Number of species			1		-	-	1		-	-			1		

ns = not sampled during the month; nc = circulator pumps not operating

Appendix H-19. Biomass (kg) of invertebrates impinged during normal operation by month, Units 1 & 2, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
Species	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Cancer antennarius			3.200		-	-	1.800		-	-			5.000	100.0	100.0
Biomass (kg)	ns	nc	3.200	ns	-	-	1.800	nc	-	-	nc	ns	5.000		

ns = not sampled during the month; nc = circulator pumps not operating

Appendix H-20. Abundance of fish impinged during normal operation by month, Units 3 and 4, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
Species	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Atherinopsis californiensis		-	-	1	-	-	-	-	-	-	1		2	50.0	50.0
Hyperprosopon argenteum		-	-	1	-	-	-	-	-	-	-		1	25.0	75.0
Paralabrax nebulifer		-	-		-	-	-	-	-	-	1		1	25.0	100.0
Number of individuals	ns	-	-	2	-	-	-	-	-	-	2	ns	4		
Number of species		-	-	2	-	-	-	-	-	-	2		3		

ns = not sampled during the month

Appendix H-21. Biomass (kg) of fish impinged during normal operation by month, Units 3 and 4, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
Species	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Atherinopsis californiensis		-	-	0.032	-	-	-	-	-	-	0.210		0.242	63.7	63.7
Paralabrax nebulifer		-	-	-	-	-	-	-	-	-	0.132		0.132	34.7	98.4
Hyperprosopon argenteum		-	-	0.006	-	-	-	-	-	-	0.000		0.006	1.6	100.0
Biomass (kg)	ns	-	-	0.038	-	-	-	-	-	-	0.342	ns	0.380		

ns = not sampled during the month

Appendix H-22. Abundance of invertebrates impinged during normal operation by month, Units 3 and 4, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
Species	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Cancer antennarius		-	-	3	-	-	-	6	412	-	-		421	89.6	89.6
Pelagia colorata		-	-	-	-	-	24	-	-	3	-		27	5.7	95.3
Pyromaia tuberculata		-	-	2	-	-	-	7	8	-	-		17	3.6	98.9
Panulirus interruptus		-	-	-	-	4	-	-	-	-	-		4	0.9	99.8
Octopus bimaculoides		-	-	-	-	-	-	1	-	-	-		1	0.2	100.0
Number of individuals	ns	-	-	5	-	4	24		420	3	-	ns	470		
Number of species		-	-	2	-	1	1		2	1	-		5		

ns = not sampled during the month

Appendix H-23. Biomass (kg) of invertebrates impinged during normal operation by month, Units 3 and 4, El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

	2000			2001										Percent	Cum.
Species	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total	Total	Percent
Cancer antennarius		-	-	0.026	-	-	-	0.140	20.600	-	0.210		20.976	51.1	51.1
Pelagia colorata		-	-		-	-	13.000	-	-	4.300	-		17.300	42.2	93.3
Panulirus interruptus		-	-		-	1.500	-	-	-	-	-		1.500	3.7	97.0
Octopus bimaculoides		-	-		-	-	-	1.200	-	-	-		1.200	2.9	99.9
Pyromaia tuberculata		-	-	0.006	-	-	-	0.014	0.020	-	-		0.040	0.1	100.0
Biomass (kg)	ns	-	-	0.032	-	1.500	13.000	1.354	20.620	4.300	0.210	ns	41.016		

ns = not sampled during the month

Appendix H-24. Abundance and biomass (kg) of fish impinged at El Segundo Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

El Segundo

	1990		1991		1992		1993		1994		1995		1996	
Species	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)
Seriphus politus	2633	77.30	184	9.09	435	9.98	2771	76.73	331	11.16	1537	82.75	1497	29.58
Atherinopsis californiensis	42	6.90	-	-	25	0.81	1709	214.68	627	89.42	1502	146.10	65	8.67
Sardinops sagax	-	-	-	-	1	0.06	1496	84.65	2192	128.52	3664	98.64	426	14.61
Xenistius californiensis	3	0.30	5	0.04	165	14.83	939	59.63	347	26.90	1218	28.61	74	2.49
Engraulis mordax	-	-	-	-	9	0.04	-	-	1	0.00	437	3.33	3855	41.88
Chromis punctipinnis	749	95.90	828	82.60	1228	168.28	363	25.79	195	18.05	366	39.02	16	1.60
Hyperprosopon argenteum	13	1.60	94	8.89	203	16.59	363	41.90	187	10.86	150	15.76	104	5.63
Genyonemus lineatus	400	0.40	2	0.29	99	0.79	105	11.41	140	9.25	196	19.76	1148	13.46
Paralabrax clathratus	563	303.70	241	107.67	207	91.58	329	101.39	216	82.00	353	107.69	28	11.32
Scomber japonicus	-	-	-	-	17	2.42	526	74.91	763	74.51	64	6.41	102	12.20
Atherinops affinis	-	-	30	1.19	2	0.15	611	32.72	61	2.50	60	2.75	65	4.02
Anisotremus davidsonii	13	4.20	68	20.75	6	3.30	52	24.97	112	49.05	35	7.57	10	5.00
Paralabrax nebulifer	242	123.00	64	28.03	45	19.40	43	21.18	210	80.07	129	22.52	14	4.49
Cheilotrema saturnum	16	4.70	54	10.23	29	7.25	10	23.71	10	16.78	67	14.73	13	2.67
Umbrina roncador	4	1.50	10	0.24	-	-	99	33.94	132	5.93	263	44.13	-	-
Phanerodon furcatus	1	0.20	87	14.35	32	6.08	226	22.51	40	3.31	36	3.61	87	7.02
Leuresthes tenuis	-	-	3	0.02	-	-	136	1.60	1	0.02	16	0.31	-	-
Trachurus symmetricus	-	-	-	-	-	-	425	33.15	141	5.55	16	2.25	10	0.51
Peprilus simillimus	-	-	-	-	8	0.61	343	14.31	72	2.36	3	0.12	38	1.24
Embiotoca jacksoni	28	11.80	33	11.20	16	6.82	13	4.79	19	11.80	8	2.03	12	1.70
Scorpaena guttata	8	3.50	5	0.68	10	1.85	19	5.74	20	4.50	72	16.87	5	1.17
*Rhacochilus vacca**	9	5.20	62	25.43	18	8.00	41	17.98	14	6.35	29	11.03	7	1.66
Cymatogaster aggregata	-	-	-	-	1	0.04	5	0.13	6	0.05	20	0.67	2	0.06
Medialuna californiensis	84	34.50	37	12.69	11	3.70	38	11.77	54	23.20	25	8.86	1	0.27
Myliobatis californica	1	2.70	-	-	-	-	25	34.93	47	46.00	52	22.68	20	11.15
Heterostichus rostratus	1	0.20	2	0.15	9	0.32	1	0.11	-	-	1	0.02	3	0.09
Rhacochilus toxotes	4	2.20	26	16.07	15	10.82	33	17.52	11	4.57	11	7.99	14	4.46
Cephaloscyllium ventriosum	-	-	-	-	-	-	1	1.46	-	-	-	-	-	-
Oxyjulis californica	-	-	2	0.03	11	1.04	45	3.61	13	1.23	6	0.54	2	0.25
Atractoscion nobilis	-	-	1	0.37	-	-	36	8.86	50	9.12	2	0.60	-	-
Porichthys notatus	-	-	13	2.37	-	-	-	-	-	-	-	-	1	0.11
Girella nigricans	12	10.40	30	18.34	10	5.87	8	6.38	21	15.48	6	4.31	1	0.53
Torpedo californica	1	15.00	1	9.50	1	9.30	-	-	-	-	-	-	1	4.90
Sebastes auriculatus	4	1.80	2	0.50	9	3.85	7	1.50	4	1.52	2	0.55	1	0.52
Pleuronichthys ritteri	1	0.10	11	2.27	2	0.20	12	0.99	10	1.20	8	1.10	2	0.16
Sphyraena argentea	-	-	-	-	-	-	56	6.98	7	0.69	12	1.12	-	-
Heterodontus francisci	-	-	2	5.86	-	-	5	6.40	-	-	-	-	1	1.83
Chilara taylori	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pleuronichthys verticalis	-	-	-	-	-	-	1	0.15	-	-	-	-	-	-
Paralichthys californicus	2	1.70	-	-	-	-	1	0.12	2	0.28	2	2.74	-	-
Halichoeres semicinctus	9	3.40	4	1.60	6	2.79	12	10.10	8	2.73	7	2.59	1	0.27
Menticirrhus undulatus	-	-	1	0.70	-	-	-	-	11	2.85	2	1.34	-	-
Urolophus halleri	-	-	1	0.35	4	2.80	17	10.10	6	2.57	3	2.15	1	0.66
Citharichthys stigmaeus	-	-	-	-	-	-	1	0.01	-	-	1	0.04	3	0.01
Ophidion scrippsae	-	-	-	-	2	0.11	-	-	-	-	-	-	-	-
Hypsurus caryi	3	0.90	7	1.32	5	1.68	12	2.45	1	0.17	-	-	-	-
Scorpaenichthys marmoratus	4	3.00	2	1.16	1	0.73	1	1.18	1	1.03	1	1.05	-	-
Hypsoblennius gilberti	-	-	-	-	-	-	-	-	-	-	4	0.04	-	-
Platyrhinoidis triseriata	2	1.00	1	0.55	-	-	2	0.73	3	1.30	-	-	1	0.58
Semicossyphus pulcher	-	-	-	-	1	0.28	1	0.18	6	1.67	3	1.70	-	-
Hermosilla azurea	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mustelus californicus	-	-	-	-	5	2.80	4	4.95	2	4.90	-	-	-	-
Rhinobatos productus	-	-	-	-	-	-	3	13.58	-	-	-	-	-	-
Sebastes miniatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Porichthys myriaster	7	1.80	-	-	-	-	1	0.17	-	-	-	-	-	-
Balistes polylepis	3	5.10	1	1.60	1	1.45	1	1.75	1	1.55	-	-	-	-
Brachyistius frenatus	-	-	-	-	1	0.02	4	0.08	-	-	4	0.26	-	-
Sebastes rastrelliger	-	-	6	3.03	2	0.60	-	-	-	-	-	-	-	-
Sebastes paucispinis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triakis semifasciata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxylebius pictus	-	-	-	-	1	0.07	-	-	-	-	-	-	-	-
Paralabrax maculatofasciatus	-	-	2	0.02	-	-	-	-	-	-	-	-	-	-
Agonopsis sterletus	-	-	-	-	1	0.00	1	0.00	-	-	-	-	-	-
Hypsoblennius, spp	-	-	-	-	2	0.01	-	-	-	-	-	-	-	-
Hypsopsetta guttulata	-	-	1	0.37	-	-	-	-	-	-	-	-	-	-

Appendix H-24. (Cont.).

El Segundo

	1990		1991		1992		1993		1994		1995		1996	
Species	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)
Hypsypops rubicundus	-	-	1	0.30	-	-	-	-	-	-	-	-	-	-
Agonopsis vulsa	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clevelandia ios	-	-	-	-	-	-	-	-	-	-	1	0.00	-	-
Gibbonsia elegans	-	-	-	-	1	0.01	-	-	-	-	-	-	-	-
Hypsoblennius gentilis	-	-	-	-	1	0.02	-	-	-	-	-	-	-	-
Orthonopias triacis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pleuronichthys coenosus	1	0.20	-	-	-	-	-	-	-	-	-	-	-	-
Ruscarius creaseri	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sebastes melanops	-	-	1	0.90	-	-	-	-	-	-	-	-	-	-
Sebastes serranoides	-	-	-	-	1	0.05	-	-	-	-	-	-	-	-
Sebastes sp	-	-	-	-	-	-	1	0.38	-	-	-	-	-	-
Sphoeroides annulatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stereolepis gigas	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Survey totals	4863	724.20	1925	400.75	2659	407.40	10954	1074.26	6095	761.00	10394	736.36	7631	196.77
Number of species	31		39		44		50		42		43		36	

* includes *Damalichthys vacca*

Note: 0.00 < 0.005; FO = frequency of occurrence

Appendix H-24. (Cont.).

El Segundo

Species	1997 No.	1997 Wt. (kg)	1998 No.	1998 Wt. (kg)	1999 No.	1999 Wt. (kg)	2000 No.	2000 Wt. (kg)	2001 No.	2001 Wt. (kg)	TOTALS No.	TOTALS Wt. (kg)	FO
Seriphus politus	4842	125.13	1049	14.70	-	-	26651	558.08	2007	60.52	43936	1055.01	11
Atherinopsis californiensis	6730	689.17	1194	104.72	12	0.80	192	16.61	119	11.40	12216	1289.28	11
Sardinops sagax	1157	27.64	207	12.05	250	11.18	246	13.85	12	1.13	9651	392.33	10
Xenistius californiensis	2836	151.40	1031	15.84	203	9.76	522	32.03	343	20.65	7685	362.47	12
Engraulis mordax	959	13.76	1	0.10	-	-	512	4.56	803	8.21	6577	71.87	8
Chromis punctipinnis	102	8.10	-	-	14	0.93	46	4.81	112	8.84	4019	453.93	11
Hyperprosopon argenteum	1264	69.10	38	11.89	-	-	842	38.64	302	13.08	3560	233.92	11
Genyonemus lineatus	1174	64.76	29	26.13	-	-	116	2.04	12	0.42	3421	148.71	11
Paralabrax clathratus	476	181.95	46	7.50	151	58.77	270	110.10	148	79.63	3028	1243.31	12
Scomber japonicus	5	0.61	9	0.94	15	1.01	2	0.23	-	-	1503	173.23	9
Atherinops affinis	240	8.33	22	0.86	8	0.12	214	13.66	4	0.19	1316	66.49	11
Anisotremus davidsonii	48	18.88	204	92.32	311	179.15	61	21.76	274	138.59	1194	565.55	12
Paralabrax nebulifer	60	20.24	3	1.58	21	11.16	33	14.67	47	11.75	911	358.09	12
Cheilotrema saturnum	129	20.57	21	0.26	120	28.53	316	22.12	49	9.71	834	161.26	12
Umbrina roncador	88	11.90	4	0.24	51	11.44	110	6.46	-	-	761	115.78	9
Phanerodon furcatus	26	1.47	-	-	7	1.70	67	4.25	65	8.46	674	72.95	11
Leuresthes tenuis	484	7.80	-	-	-	-	-	-	-	-	640	9.75	5
Trachurus symmetricus	3	0.58	-	-	-	-	2	0.20	10	0.83	607	43.06	7
Peprilus simillimus	14	0.49	66	28.55	-	-	-	-	-	-	544	47.67	7
Embiotoca jacksoni	21	6.60	47	1.19	18	8.29	73	12.71	51	11.72	338	90.65	12
Scorpaena guttata	39	13.26	21	5.66	3	0.68	74	9.93	61	6.31	337	70.14	12
*Rhacochilus vacca**	58	16.05	2	0.91	15	7.63	50	8.58	28	7.61	333	116.44	12
Cymatogaster aggregata	30	0.61	-	-	-	-	170	3.09	87	0.84	321	5.48	8
Medialuna californiensis	15	5.26	1	0.03	12	5.05	2	0.93	3	1.34	283	107.60	12
Myliobatis californica	78	190.09	1	0.07	1	7.00	8	7.44	10	33.07	243	355.13	10
Heterostichus rostratus	-	-	44	1.31	27	0.76	94	3.29	27	0.71	209	6.95	10
Rhacochilus toxotes	27	12.10	18	6.37	14	7.22	9	6.30	22	9.14	204	104.76	12
Cephaloscyllium ventriosum	-	-	177	16.49	1	2.50	-	-	3	9.40	182	29.85	4
Oxyjulis californica	9	0.43	66	18.39	-	-	2	0.22	2	0.17	158	25.91	10
Atractoscion nobilis	17	4.00	18	2.45	1	0.80	6	2.00	1	0.03	132	28.23	9
Porichthys notatus	-	-	29	11.29	58	3.31	30	1.67	-	-	130	18.75	5
Girella nigricans	5	3.96	1	0.08	-	-	3	1.97	17	16.56	114	83.88	11
Torpedo californica	-	-	-	-	-	-	90	606.66	-	-	94	645.36	5
Sebastes auriculatus	2	0.21	1	0.46	-	-	60	2.87	-	-	92	13.77	10
Pleuronichthys ritteri	5	0.39	22	4.20	-	-	10	1.99	3	0.42	86	13.02	11
Sphyraena argentea	1	0.05	1	0.02	-	-	-	-	-	-	77	8.86	5
Heterodontus francisci	1	2.69	25	0.80	1	5.52	-	-	30	140.86	65	163.95	7
Chilara taylori	-	-	-	-	-	-	60	4.45	-	-	60	4.45	1
Pleuronichthys verticalis	-	-	25	7.44	-	-	32	0.25	-	-	57	7.84	3
Paralichthys californicus	6	5.63	1	0.04	-	-	2	2.69	41	1.94	57	15.15	8
Halichoeres semicinctus	6	2.14	-	-	-	-	-	-	2	0.33	55	25.95	9
Menticirrhus undulatus	7	2.37	24	6.94	2	1.33	3	1.46	3	1.31	53	18.31	8
Urolophus halleri	6	3.22	5	3.70	-	-	3	1.47	4	2.09	50	29.11	10
Citharichthys stigmaeus	-	-	-	-	-	-	38	0.27	4	0.05	47	0.38	5
Ophidion scrippsae	-	-	-	-	-	-	32	0.07	1	0.05	35	0.23	3
Hypsurus caryi	-	-	-	-	-	-	-	-	-	-	28	6.52	5
Scorpaenichthys marmoratus	2	3.15	3	1.27	-	-	3	0.65	4	2.81	22	16.02	10
Hypsoblennius gilberti	3	0.03	-	-	10	0.04	-	-	1	0.00	18	0.11	4
Platyrhinoidis triseriata	1	0.84	2	0.01	-	-	1	0.05	3	3.18	16	8.25	9
Semicossyphus pulcher	-	-	-	-	-	-	-	-	3	6.28	14	10.11	5
Hermosilla azurea	-	-	-	-	1	0.48	1	0.35	10	4.52	12	5.35	3
Mustelus californicus	1	1.20	-	-	-	-	-	-	-	-	12	13.85	4
Rhinobatos productus	8	7.84	-	-	1	4.50	-	-	-	-	12	25.92	3
Sebastes miniatus	-	-	-	-	-	-	12	0.38	-	-	12	0.38	1
Porichthys myriaster	-	-	-	-	-	-	2	0.80	1	0.04	11	2.81	4
Balistes polylepis	-	-	-	-	1	2.00	-	-	1	2.15	9	15.60	7
Brachyistius frenatus	-	-	-	-	-	-	-	-	-	-	9	0.36	3
Sebastes rastrelliger	1	0.37	-	-	-	-	-	-	-	-	9	4.00	3
Sebastes paucispinis	-	-	-	-	-	-	7	0.89	-	-	7	0.89	1
Triakis semifasciata	-	-	-	-	1	8.00	5	9.55	-	-	6	17.55	2
Oxylebius pictus	-	-	-	-	-	-	2	0.01	2	0.19	5	0.28	3
Paralabrax maculatofasciatus	1	0.02	-	-	-	-	-	-	-	-	3	0.04	2
Agonopsis sterletus	-	-	-	-	-	-	-	-	-	-	2	0.00	2
Hypsoblennius, spp	-	-	-	-	-	-	-	-	-	-	2	0.01	1
Hypsopsetta guttulata	-	-	-	-	-	-	-	-	1	0.24	2	0.61	2

Appendix H-24. (Cont.).

El Segundo

	1997		1998		1999		2000		2001		TOTALS		
Species	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	FO
Hypsypops rubicundus	-	-	-	-	-	-	-	-	1	0.35	2	0.65	2
Agonopsis vulsa	-	-	-	-	-	-	1	0.00	-	-	1	0.00	1
Clevelandia ios	-	-	-	-	-	-	-	-	-	-	1	0.00	1
Gibbonsia elegans	-	-	-	-	-	-	-	-	-	-	1	0.01	1
Hypsoblennius gentilis	-	-	-	-	-	-	-	-	-	-	1	0.02	1
Orthonopias triacis	-	-	-	-	-	-	1	0.00	-	-	1	0.00	1
Pleuronichthys coenosus	-	-	-	-	-	-	-	-	-	-	1	0.20	1
Ruscarius creaseri	-	-	-	-	-	-	1	0.00	-	-	1	0.00	1
Sebastes melanops	-	-	-	-	-	-	-	-	-	-	1	0.90	1
Sebastes serranoides	-	-	-	-	-	-	-	-	-	-	1	0.05	1
Sebastes sp	-	-	-	-	-	-	-	-	-	-	1	0.38	1
Sphoeroides annulatus	-	-	1	0.05	-	-	-	-	-	-	1	0.05	1
Stereolepis gigas	1	6.10	-	-	-	-	-	-	-	-	1	6.10	1
Survey totals	20988	1710.46	4454	406.84	1330	379.66	31086	1557.04	4734	637.12	107113	8991.86	
Number of species	45		38		29		50		45		78		

* includes *Damalichthys vacca*

Note: 0.00 < 0.005; FO = frequency of occurrence

Appendix H-25. Abundance and biomass (kg) of fish impinged at Scattergood Generating Station. El Segundo and Scattergood Generating Stations NPDES, 2001.

Scattergood

	1990		1991		1992		1993		1994		1995		1996	
Species	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)
Seriphus politus	4999	217.60	11963	594.40	926	41.80	1368	36.70	9331	257.64	9416	191.18	50588	1161.10
Atherinops affinis	958	54.50	7042	278.60	5038	207.18	180	7.07	5717	239.72	3316	125.03	8228	327.94
Trachurus symmetricus	7	1.30	9	0.85	24	2.46	32	2.07	69089	2248.01	34	3.37	14	0.67
Sardinops sagax	7	0.80	4	0.70	24	2.93	1715	98.06	8574	430.07	159	9.79	8628	463.43
Atherinopsis californiensis	127	20.80	141	24.75	334	65.31	91	14.27	12668	1424.31	1111	125.25	5462	362.68
Genyonemus lineatus	38	4.00	219	33.45	37	3.43	70	8.85	6091	65.07	2609	126.17	4586	248.32
Engraulis mordax	25	0.20	1584	18.12	11896	78.00	4	0.03	1	0.02	121	0.71	1109	14.29
Xenistius californiensis	548	23.80	2637	40.70	64	5.22	212	11.11	2060	90.18	1587	15.89	3293	153.69
Umbrina roncador	59	28.90	84	24.00	114	38.92	32	3.88	323	39.80	286	19.71	4731	623.32
Hyperprosopon argenteum	373	28.20	330	30.10	1362	26.36	136	12.74	274	19.46	769	61.48	1291	61.03
Paralabrax nebulifer	313	137.80	429	226.70	243	96.86	137	63.83	720	270.06	174	61.60	562	172.83
Anisotremus davidsonii	810	411.20	461	217.65	310	175.10	872	422.68	591	243.96	30	8.02	70	28.24
Scomber japonicus	2	0.50	6	0.80	100	7.60	71	6.99	2620	185.12	346	71.90	280	38.51
Chromis punctipinnis	432	55.80	419	52.80	188	12.73	191	5.90	401	43.33	60	7.36	93	8.57
Paralabrax clathratus	453	230.60	243	60.15	113	28.04	135	37.73	168	37.33	69	13.51	257	55.36
Leuresthes tenuis	324	8.10	289	0.68	-	-	11	0.12	18	0.39	551	8.83	13	0.32
Cymatogaster aggregata	11	0.60	22	0.76	8	0.18	1	0.04	29	0.67	90	3.34	708	12.02
Phanerodon furcatus	69	8.60	212	18.70	31	2.56	1	0.13	43	1.85	37	1.62	340	20.57
Cheilotrema saturnum	35	5.40	108	14.95	20	2.98	44	7.32	189	15.33	31	3.19	100	7.86
Porichthys notatus	273	30.10	526	66.00	26	1.58	18	2.56	29	4.27	10	0.54	40	4.43
Peprillus simillimus	147	8.00	224	11.30	13	0.91	34	1.66	21	1.19	10	0.51	267	7.14
Embiotoca jacksoni	59	10.90	31	8.82	12	2.09	4	1.30	21	3.32	69	2.67	107	7.81
Atractoscion nobilis	5	3.00	12	3.10	8	1.30	5	2.14	98	18.85	20	5.32	48	11.87
Myliobatis californica	11	10.80	16	32.60	22	17.95	3	1.68	20	81.02	60	168.85	78	209.82
Rhacochilus toxotes	25	11.70	53	66.00	88	16.91	5	2.61	28	4.55	8	2.05	44	8.29
Menticirrhus undulatus	7	3.00	10	3.85	7	2.65	2	1.12	67	5.06	23	3.94	48	8.61
Scorpaena guttata	24	6.00	25	5.00	5	0.69	18	3.12	79	13.02	24	5.07	52	12.60
Urolophus halleri	5	2.90	21	11.65	21	15.07	11	5.33	38	21.02	18	11.05	48	31.80
Medialuna californiensis	33	10.00	27	8.95	41	9.88	35	9.34	50	15.50	9	3.66	34	8.06
Cephaloscyllium ventriosum	-	-	1	2.85	-	-	-	-	-	-	-	-	-	-
Pleuronichthys ritteri	7	0.80	36	4.85	10	0.50	25	2.44	13	1.35	18	1.86	18	1.59
Sebastes paucispinis	-	-	134	3.95	5	1.69	-	-	-	-	-	-	1	0.02
*Rhacochilus vacca**	38	10.10	92	14.65	16	2.72	9	3.79	2	0.81	18	1.00	8	1.26
Oxyjulis californica	-	-	6	0.23	32	1.58	108	4.14	42	2.04	3	0.33	6	0.54
Girella nigricans	33	20.30	50	32.65	12	8.56	20	12.73	35	25.78	4	3.40	4	1.73
Halichoeres semicinctus	12	3.90	19	7.74	14	2.37	22	5.09	34	5.48	5	1.73	16	4.18
Platyrhinoidis triseriata	13	6.60	31	16.60	11	7.54	4	1.96	8	2.72	7	4.71	12	5.81
Anchoa compressa	-	-	11	0.11	-	-	3	0.00	1	0.01	2	0.04	1	0.02
Paralichthys californicus	8	3.60	17	6.55	2	1.62	2	1.69	6	2.01	1	2.75	16	11.22
Heterostichus rostratus	6	0.40	9	0.60	14	0.68	2	0.06	12	0.34	15	0.88	51	1.05
Hypsoblennius gilberti	-	-	2	0.05	12	0.03	35	0.06	1	0.00	3	0.03	6	0.02
Sphyraena argentea	37	9.50	27	7.25	5	2.08	8	0.35	9	0.70	6	0.21	5	1.88
Mustelus californicus	21	27.60	22	33.50	6	8.20	1	2.00	15	14.96	-	-	8	16.35
Scorpaenichthys marmoratus	2	0.30	14	4.95	4	3.34	4	1.85	8	2.43	3	0.71	9	3.03
Brachyistius frenatus	4	0.20	12	0.50	4	0.08	1	0.06	28	0.84	14	0.41	19	0.37
Rhinobatos productus	4	7.40	10	26.60	5	11.24	2	8.85	5	8.24	-	-	10	28.09
Sebastes auriculatus	2	0.50	6	1.95	1	0.41	2	0.18	7	2.51	5	2.45	5	1.96
Hermosilla azurea	21	10.00	1	0.05	-	-	1	0.52	2	1.48	-	-	-	-
Heterodontus francisci	-	-	4	5.90	-	-	1	3.52	1	2.50	3	6.86	1	1.54
Triakis semifasciata	2	5.00	4	34.50	2	8.05	1	1.42	4	24.82	-	-	1	9.20
Hypsurus caryi	2	0.40	14	0.92	9	0.74	-	-	1	0.34	1	0.15	-	-
Hypsopsetta guttulata	4	1.20	1	0.45	1	0.35	1	0.26	-	-	3	0.58	4	0.48
Sebastes serranoides	1	0.10	-	-	4	0.24	-	-	3	1.06	-	-	1	0.08
Ophidion scrippsae	-	-	5	0.40	-	-	-	-	2	0.02	-	-	2	0.07
Sebastes miniatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hypsoblennius, spp	19	0.10	-	-	-	-	-	-	-	-	-	-	-	-
Porichthys myriaster	2	0.70	1	0.33	-	-	1	0.46	-	-	1	0.31	2	0.29
Sebastes rastrelliger	2	0.60	7	1.30	-	-	-	-	2	0.52	4	1.57	-	-
Pleuronichthys verticalis	2	0.20	-	-	-	-	-	-	-	-	2	0.21	-	-
Citharichthys stigmaeus	-	-	-	-	1	0.01	-	-	-	-	-	-	3	0.02
Semicossyphus pulcher	-	-	-	-	-	-	-	-	7	2.56	-	-	-	-
Chilara taylori	2	0.02	-	-	-	-	-	-	2	0.07	-	-	-	-
Mustelus henlei	-	-	2	3.30	1	1.56	-	-	2	5.36	-	-	-	-
Oxylebius pictus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Syngnathus californiensis	-	-	-	-	1	0.00	-	-	1	0.00	-	-	-	-

Appendix H-25. (Cont.).

Scattergood

	1990		1991		1992		1993		1994		1995		1996	
Species	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)
Balistes polylepis	2	3.50	2	3.80	-	-	-	-	-	-	-	-	-	-
Paralabrax maculatofasciatu	-	-	-	-	1	0.68	1	0.92	-	-	1	0.01	-	-
Syngnathus spp	-	-	-	-	-	-	-	-	1	0.01	-	-	1	0.00
Torpedo californica	-	-	-	-	-	-	1	4.72	1	13.00	-	-	2	16.20
Hypsypops rubicundus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hypsoblennius jenkinsi	-	-	1	0.00	2	0.01	-	-	-	-	-	-	-	-
Xystreurys liolepis	-	-	-	-	1	0.28	-	-	1	0.42	-	-	-	-
Gibbonsia elegans	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagrammos decagrammus	-	-	2	0.06	-	-	-	-	-	-	-	-	-	-
Ruscarius creaseri	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Squalus acanthias	-	-	2	2.20	-	-	-	-	-	-	-	-	-	-
Stereolepis gigas	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agonopsis sp	-	-	-	-	-	-	-	-	-	-	-	-		
Clinocottus analis	-	-	-	-	-	-	-	-	-	-	1	0.01	-	-
Gibbonsia metzi	-	-	1	0.05	-	-	-	-	-	-	-	-	-	-
Gobiesox rhessodon	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
Hippoglossina stomata	-	-	1	0.45	-	-	-	-	-	-	-	-	-	-
Hypsoblennius gentilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micrometrus minimus	-	-	-	-	-	-	-	-	1	0.04	-	-	-	-
Pleuronichthys coenosus	-	-	-	-	-	-	-	-	-	-	1	0.37	-	-
Roncador stearnsii	-	-	-	-	-	-	1	1.40	-	-	-	-	-	-
Sebastes rubrivinctus	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
Sphoeroides annulatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strongylura exilis	-	-	1	0.25	-	-	-	-	-	-	-	-	-	-
Symphurus atricauda	-	-	-	-	-	-	-	-	-	-	-	-	1	0.00
Syngnathus leptorhynchus	-	-	1	0.05	-	-	-	-	-	-	-	-	-	-
Survey totals	10425	1448.12	27696	2075.72	21251	931.23	5694	828.82	119615	5902.54	21168	1092.18	91334	4178.14
Number of species	53		64		54		53		60		52		58	

* includes *Damalichthys vacca*

Note: 0.00 < 0.005; FO = frequency of occurrence

Appendix H-25. (Cont.).

Scattergood

Species	1997		1998		1999		2000		2001		TOTALS		FO
	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	
Seriphus politus	8225	138.64	16178	352.68	4258	111.93	38661	1070.86	10620	312.62	166533	4487.14	12
Atherinops affinis	2261	86.86	3042	133.5	24093	750.49	16061	393.91	3793	105.92	79729	2710.74	12
Trachurus symmetricus	3	0.08	-	-	-	-	14	1.69	1	0.11	69227	2260.61	10
Sardinops sagax	78	2.99	3555	121.60	3261	119.01	16014	597.56	19932	671.37	61951	2518.30	12
Atherinopsis californiensis	375	41.17	1262	142.7	3901	185.33	16548	688.24	2766	277.63	44786	3372.41	12
Genyonemus lineatus	640	22.07	5288	387.9	78	4.75	13906	955.67	589	30.95	34151	1890.66	12
Engraulis mordax	2871	15.45	72	0.6	1661	7.27	3736	20.49	40	0.46	23120	155.59	12
Xenistius californiensis	822	38.68	1593	42.64	149	6.32	3311	196.34	199	10.71	16475	635.28	12
Umbrina roncador	2403	334.59	452	78.00	2554	813.28	5291	815.57	105	22.80	16434	2842.75	12
Hyperprosopon argenteum	874	32.69	325	9.3	1	0.08	437	40.88	323	15.61	6495	337.95	12
Paralabrax nebulifer	301	85.32	339	91.9	300	117.59	334	111.54	243	86.35	4095	1522.41	12
Anisotremus davidsonii	95	36.46	261	91.4	35	18.17	275	150.84	113	67.41	3923	1871.17	12
Scomber japonicus	24	3.26	10	1.90	-	-	3	0.55	5	0.68	3467	317.81	11
Chromis punctipinnis	24	3.22	4	0.1	29	2.52	34	4.19	33	3.94	1908	200.42	12
Paralabrax clathratus	110	18.61	171	19.2	50	9.17	73	17.77	22	1.54	1864	529.01	12
Leuresthes tenuis	23	0.52	87	1.3	10	0.13	2	0.05	4	0.08	1332	20.47	11
Cymatogaster aggregata	86	1.34	38	1.6	9	0.44	108	3.01	59	0.77	1169	24.73	12
Phanerodon furcatus	153	7.40	5	0.4	1	0.10	76	4.84	35	1.38	1003	68.18	12
Cheilotrema saturnum	220	18.00	39	2.7	51	9.44	53	4.62	73	5.28	963	97.09	12
Porichthys notatus	19	1.27	2	0.3	8	0.91	2	0.21	1	0.39	954	112.53	12
Peprillus simillimus	3	0.06	-	-	1	0.06	7	0.33	9	0.29	736	31.46	11
Embiotoca jacksoni	21	2.12	11	3.2	17	3.02	98	9.60	19	3.10	469	57.90	12
Atractoscion nobilis	105	25.09	98	26.4	9	5.38	40	18.39	11	2.59	459	123.46	12
Myliobatis californica	8	6.81	14	60.8	15	34.73	42	41.49	107	433.72	396	1100.28	12
Rhacochilus toxotes	41	5.02	30	7.7	9	4.85	20	5.62	34	4.79	385	140.14	12
Menticirrhus undulatus	18	5.22	110	9.3	33	7.43	48	11.56	10	1.63	383	63.36	12
Scorpaena guttata	29	7.40	36	4.54	7	0.26	30	7.94	22	5.93	351	71.58	12
Urolophus halleri	4	2.74	53	29.74	25	16.22	42	25.80	27	17.66	313	190.97	12
Medialuna californiensis	19	5.84	24	9.1	1	0.13	1	0.23	3	0.24	277	80.95	12
Cephaloscyllium ventriosum	-	-	272	26.7	-	-	1	1.35	-	-	274	30.90	3
Pleuronichthys ritteri	18	2.07	82	11.6	8	0.63	24	2.40	9	0.76	268	30.82	12
Sebastes paucispinis	-	-	-	-	126	1.29	1	0.01	-	-	267	6.96	5
*Rhacochilus vacca**	18	1.62	11	3.9	3	1.42	15	1.86	1	0.11	231	43.21	12
Oxyjulis californica	2	0.17	1	0.1	6	0.46	-	-	1	0.11	207	9.65	10
Girella nigricans	1	0.85	12	6.3	4	3.66	6	3.47	2	2.05	183	121.44	12
Halichoeres semicinctus	8	1.77	14	2.0	8	1.26	20	3.01	3	0.57	175	39.10	12
Platyrhinoidis triseriata	17	9.37	56	21.5	1	0.23	9	3.34	2	0.86	171	81.23	12
Anchoa compressa	55	0.75	94	1.8	-	-	1	0.02	1	0.02	169	2.72	9
Paralichthys californicus	7	6.85	66	9.7	10	9.69	16	9.21	5	4.97	156	69.83	12
Heterostichus rostratus	3	0.09	15	0.4	6	0.12	10	0.21	1	0.12	144	4.90	12
Hypsoblennius gilberti	3	0.01	50	0.1	3	0.01	17	0.03	2	0.01	134	0.34	11
Sphyraena argentea	4	1.13	14	9.02	-	-	12	3.33	4	1.71	131	37.16	11
Mustelus californicus	4	9.80	3	5.6	-	-	8	14.72	3	3.17	91	135.92	10
Scorpaenichthys marmoratus	1	0.76	-	-	14	0.34	13	3.29	15	5.84	87	26.84	11
Brachyistius frenatus	-	-	-	-	-	-	-	-	-	-	82	2.46	7
Rhinobatos productus	3	5.18	3	11.8	3	20.99	6	23.00	3	14.69	54	166.03	11
Sebastes auriculatus	-	-	2	1.15	1	0.42	2	0.49	2	0.49	35	12.50	11
Hermosilla azurea	-	-	-	-	1	0.54	6	3.64	-	-	32	16.23	6
Heterodontus francisci	3	7.34	7	10.3	1	3.00	8	19.75	1	0.82	30	61.49	10
Triakis semifasciata	3	6.10	1	2.00	6	41.30	5	25.62	-	-	29	158.01	10
Hypsurus caryi	-	-	-	-	-	-	-	-	-	-	27	2.55	5
Hypsopsetta guttulata	-	-	4	0.8	3	0.48	4	0.92	-	-	25	5.53	9
Sebastes serranoides	-	-	-	-	-	-	16	0.40	-	-	25	1.88	5
Ophidion scrippsae	1	0.05	8	0.1	1	0.01	2	0.03	-	-	21	0.69	7
Sebastes miniatus	-	-	-	-	17	0.05	4	0.01	-	-	21	0.06	2
Hypsoblennius, spp	-	-	-	-	-	-	-	-	-	-	19	0.10	1
Porichthys myriaster	1	0.64	2	0.6	3	0.87	4	1.08	-	-	17	5.31	9
Sebastes rastrelliger	1	0.66	-	-	-	-	-	-	1	0.66	17	5.31	6
Pleuronichthys verticalis	-	-	5	0.9	1	0.07	4	0.31	-	-	14	1.64	5
Citharichthys stigmaeus	2	0.02	-	-	4	0.02	-	-	-	-	10	0.06	4
Semicossyphus pulcher	-	-	1	0.02	-	-	-	-	-	-	8	2.58	2
Chilara taylori	2	0.05	-	-	-	-	1	0.03	-	-	7	0.17	4
Mustelus henlei	-	-	1	1.5	1	1.85	-	-	-	-	7	13.57	5
Oxylebius pictus	-	-	-	-	4	0.03	2	0.04	-	-	6	0.06	2
Syngnathus californiensis	-	-	1	0.01	-	-	3	0.02	-	-	6	0.03	4

Appendix H-25. (Cont.).

Scattergood

	1997		1998		1999		2000		2001		TOTALS		
Species	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	No.	Wt. (kg)	FO
Balistes polylepis	-	-	1	2.2	-	-	-	-	-	-	5	9.52	3
Paralabrax maculatofasciatu	1	0.68	1	0.0	-	-	-	-	-	-	5	2.31	5
Syngnathus spp	-	-	-	-	-	-	3	0.00	-	-	5	0.01	3
Torpedo californica	-	-	1	18.70	-	-	-	-	-	-	5	52.62	4
Hypsypops rubicundus	-	-	1	0.0	1	0.10	2	0.41	-	-	4	0.52	3
Hypsoblennius jenkinsi	-	-	-	-	-	-	-	-	-	-	3	0.01	2
Xystreurys liolepis	-	-	-	-	-	-	1	0.07	-	-	3	0.77	3
Gibbonsia elegans	-	-	-	-	2	0.03	-	-	-	-	2	0.03	1
Hexagrammos decagrammus	-	-	-	-	-	-	-	-	-	-	2	0.06	1
Ruscarius creaseri	-	-			-	-	-	-	2	0.00	2	0.00	1
Squalus acanthias	-	-	-	-	-	-	-	-	-	-	2	2.20	1
Stereolepis gigas	1	0.75	-	-	-	-	1	0.74	-	-	2	1.49	2
Agonopsis sp	-	-	-	-	-	-	1	0.00	-	-	1	0.00	1
Clinocottus analis	-	-	-	-	-	-	-	-	-	-	1	0.01	1
Gibbonsia metzi	-	-	-	-	-	-	-	-	-	-	1	0.05	1
Gobiesox rhessodon	-	-	-	-	-	-	-	-	-	-	1	0.00	1
Hippoglossina stomata	-	-	-	-	-	-	-	-	-	-	1	0.45	1
Hypsoblennius gentilis	1	0.01	-	-	-	-	-	-	-	-	1	0.01	1
Micrometrus minimus	-	-	-	-	-	-	-	-	-	-	1	0.04	1
Pleuronichthys coenosus	-	-	-	-	-	-	-	-	-	-	1	0.37	1
Roncador stearnsii	-	-	-	-	-	-	-	-	-	-	1	1.40	1
Sebastes rubrivinctus	-	-	-	-	-	-	-	-	-	-	1	0.00	1
Sphoeroides annulatus	-	-	1	1.46	-	-	-	-	-	-	1	1.46	1
Strongylura exilis	-	-	-	-	-	-	-	-	-	-	1	0.25	1
Symphurus atricauda	-	-	-	-	-	-	-	-	-	-	1	0.00	1
Syngnathus leptorhynchus	-	-	-	-	-	-	-	-	-	-	1	0.05	1
Survey totals	20015	1005.58	33829	1780.62	40804	2317.85	115495	5322.58	39256	2122.87	546582	29006.25	
Number of species	53		56		53		62		47		91		

* includes *Damalichthys vacca*
Note: 0.00 < 0.005; FO = frequency of occurrence